

May 21, 1931

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TO GET A BIRD'S EYE VIEW OF CONDITIONS

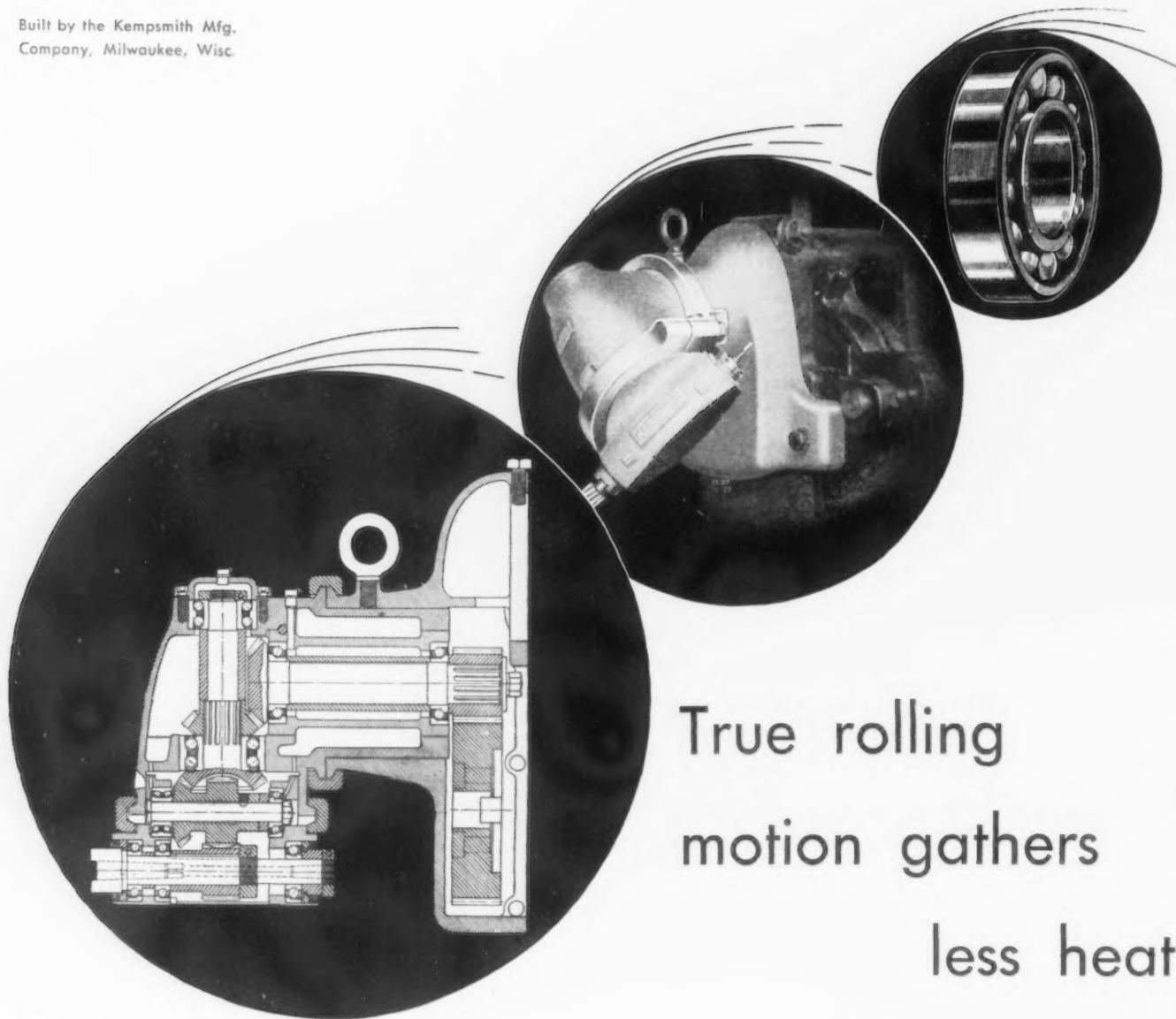
If you want to keep reliably informed as to the state of things in the industries consuming metals, read the iron and steel market reports, and you will know where business is good and where it is poor.

Here are a few extracts from last week's reports:

Steam shovel makers in Ohio continue operations at near peak. . . . Outlook in the Chicago structural field is the best so far this year. . . . Electric refrigerator makers have cut down on their orders (for sheets) in the last fortnight. . . . Steel business from the automotive industry fell off somewhat; it seems doubtful if present production will be maintained in June. . . . Road scraper manufacturers look forward to a good volume of orders later in the season. . . . Makers of office furniture and steel shelving are not so active. . . . Conductor pipe manufacturers are taking larger quantities (of sheets). . . . Agricultural implement makers are again scaling down operations. . . . Small container manufacturers are probably the most active among Chicago sheet users.

The market reports in this issue begin on page 1699.
—A. H. D.

Built by the Kempsmith Mfg.
Company, Milwaukee, Wisc.



True rolling motion gathers less heat

YOU can work New Departure Ball Bearings all day long without running them into dangerous temperatures. And in these days of increased speeds, excessive heat and all that it indicates is a thing to be avoided. Such troubles are guarded against in the high-speed milling attachment shown, because every shaft is carried on New Departures. All are angular contact

type bearings . . . preloaded for rigidity and lasting accuracy. This unit is a fine example of design compactness, a most desirable attribute which New Departures help to attain because of their own simple compactness and because each one is packed full of thrust capacity and radial stability. The New Departure Manufacturing Co., Bristol, Conn.; Chicago, Detroit, and San Francisco.

NEW DEPARTURE BALL BEARINGS

THIS ISSUE IN BRIEF

MAY 21, 1931

NEXT WEEK

DEPRESSION leads to merciless pruning of expenses. The danger is that industry will carry economizing to the extreme, eliminating expenditures that are really essential from a long-time point of view.

Abandoning apprenticeship training is a temptation in a time like this, but such action is short-sighted and harmful to all concerned. Apprentices suffer because of interruption of their training; the company suffers because its "fair weather" policy discourages future enrollments and chills the attitude of parents and the general public. "What About Apprentices These Days?" will be discussed by a national authority in our next issue.

Milling Cutter, Inserted Blades Tipped with Tungsten Carbide

The small steel blade is milled out to receive the tip which is brazed to it. Blades are then tack-welded to the body of the cutter.—Page 1673.

* * *

Tungsten Carbide Reduces Machining Allowances

Scale of the average casting can be milled almost as easily as the inner surfaces. Where allowance has been $\frac{1}{8}$ to $\frac{1}{4}$ in., it can safely be reduced to $\frac{1}{16}$ to $\frac{1}{8}$ in.—Page 1673.

* * *

Tantalum Carbide Successfully Applied to Milling Cutters

Tungsten carbide is not always satisfactory in cutting steel due to cratering action, caused by the affinity tungsten has for steel. Tantalum has not this affinity, and difficulty in brazing it to the tool has been overcome.—Page 1673.

* * *

Detects Flaws in Specimens with Varying Sections

With X-ray tests, thicker sections are under-exposed. Gamma rays, with shorter wave length, make it possible to obtain satisfactory radiographs of entire specimen.—Page 1652.

* * *

Tests Welds and Castings with Gamma Rays

Equipment is completely portable, the rays have great penetrating power, and the test is easily and quickly made.—Page 1654.

* * *

Incentive for Effort Should Be 25 Per Cent Over Daily Pay

Machine tool plant's wage incentive plan is based on payment of a base hour rate plus a premium based on costs per 100 units produced. If set time calls for output of 10 pieces per hr., the premium for 15 pieces is the man's hour rate for 30 min.—Page 1658.

* * *

Elaborate Production Control Operated Economically

Two men and a girl handle all production control work and in addition much of the cost work. System provides daily production and cost figures for each department, figures for wage incentive system, and a production control sheet for the management.—Page 1657.

Operators' Daily Production Record Posted in Department

Foreman and each man learns what each operator did the preceding day and how much each earned in premiums.—Page 1661.

* * *

Friction Between Departments Over Tool Accuracy Eliminated

Jigs, fixtures, tools and gages are inspected by a standards division, preventing disputes between departments as to accuracy, and saving time, money and labor.—Page 1665.

* * *

Metal Not Dumped Unless Operator's Weight Depresses Platform

This releases a safety pawl. At the same time a safety switch above operator's head must be thrown before motor operating ladle can function.—Page 1667.

* * *

Machinery Builder Sets a Standard for Practically Every Operation

Plain cylindrical grinding is computed on a cu. in. basis, drilling is on an r.p.m. and feed basis, milling on so many thousandths cut per tooth, planing on ft. per min. at a given feed per stroke.—Page 1661.

* * *

Penalty for Scrapped Work Reduces Spoilage

Spoiled work is taken from operator's future premiums at same rate as is allowed for excess production.—Page 1659.

* * *

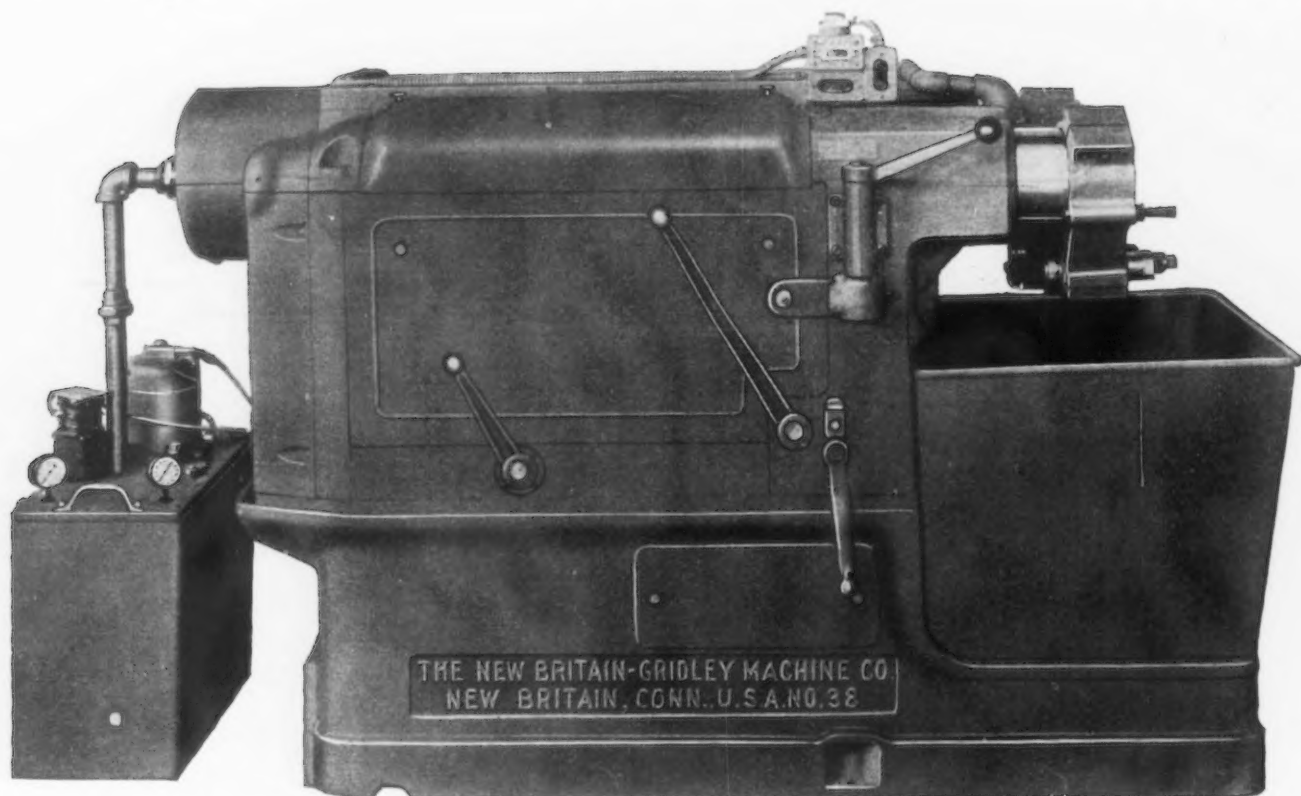
Costs Are Lowered by Production Control System

Management is able to control costs. They know what costs should be and can find the cause if they are too high. Quality of work is improved and plant efficiency is increased as men know they are paid according to output.—Page 1661.

* * *

Formula for Arriving at Economical Production Quantities

Machinery builder multiplies twice the preparation cost by the demand per annum and divides it by value of piece times a percentage representing cost of carrying the stock.—Page 1662.



NUMBER 38 NEW BRITAIN AUTOMATIC CHUCKING MACHINE

Compact and rigid to the extreme, smooth and vibrationless under any possible cutting stress. The durability of the most modern cutting tools alone limits production from this powerful single spindle Automatic Chucking Machine.

Regularly equipped with a 10½" hydraulic chuck and two massive tool slides, each capable of both longitudinal and radial cuts.

THE NEW BRITAIN-GRIDLEY MACHINE CO.
NEW BRITAIN, CONN.
U. S. A.



THE IRON AGE

New York, May 21, 1931

ESTABLISHED 1855

VOL. 127, No. 21

NON-DESTRUCTIVE TESTING WITH GAMMA RAYS

By DR. ROBERT F. MEHL

Superintendent, Division of Physical Metallurgy,
Naval Research Laboratory,
Bellevue, D. C.

WORK which has been done at the Naval Research Laboratory on the use of gamma rays in radiography has been limited almost entirely to steel castings. There is no fundamental difference in the application of a radiographic method to welds—in both, physical discontinuities are sought, and for this reason the results obtained on steel castings may be taken as indicative of the method in general.

To clarify the subject at the beginning it should be said immediately that gamma ray radiography in principle is exactly similar to X-ray radiography, both methods using light rays which will penetrate opaque objects and cast shadow pictures which reveal hidden defects. The differences between the two methods are two in kind: (1) those differences in penetration and scattering of the ray resulting from the shorter wave-length of the gamma ray; and (2) those differences in operation or manipulation resulting from differing physical features of the necessary equipment.

Both methods depend

upon the penetration of light rays, the X-ray and the gamma ray, through opaque objects. The efficiency of this penetration is dependent directly upon the wave-length of the ray, the shorter or "harder" ray showing the more efficient penetration. Either ray may be characterized, therefore, by a wave-length, or better, an effective wave-length.

It may be seen from Fig. 1 that the effective wave-length of the ray from a commercial high-tension X-ray bulb is about 0.15 Angström units whereas that of the gamma ray from radium is about 0.01 such units. This much shorter wave-length means, radiographically, that a smaller fraction of the beam will be absorbed in passing through a unit thickness of material.

With an effective wave-length of 0.15 Angström units, the practical limit of thickness of steel to be radiographed is about 3½ in. Beyond this the exposure times become extremely great. Thus for 6 in. of steel an exposure time, calculated, of about 500 hr. would be required. With gamma rays, because of

OF the three major methods of non-destructive testing — magnetic, X-ray, and gamma ray—the last mentioned is the one which has been developed and studied most recently. Some of its advantages, such as its ease of application and its ability to penetrate steel up to 10 in., are discussed in this article, including results on steel castings and welds. The article, published with the permission of the United States Navy, is based on an address delivered by Doctor Mehl at a joint meeting of the New York members of the American Society for Steel Treating and the American Welding Society.

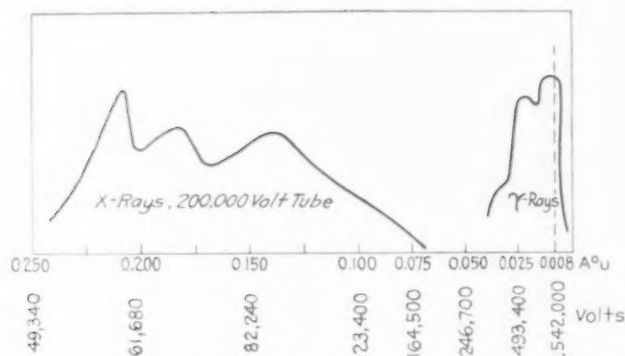


Fig. 1—Comparison of wave-lengths of the gamma ray and the X-ray.

their much shorter wave-lengths, the time of exposure does not increase so very rapidly with increasing thickness. Quite satisfactory exposures have been obtained up to 10 in. of steel without using ridiculous quantities of radium or unconscionably long exposure times.

It will not be possible to say here much about the physics of radium. It should be sufficient, however, merely to state that a radium salt contained in a small metal capsule, or radium emanation, a radioactive gas which radium gives off, held in a small glass and metal capsule, may be used. If the emanation, known chemically as radon, is used, a correction in the exposure time must be made to allow for the fairly rapid loss in strength with time. For simplicity's sake let us disregard radium emanation and deal only with radium.

Determining Time for Exposure

Before attempting to prepare any radiographs it is necessary to know what the exposure times should be. These data have now been accurately determined. (Fig. 2). The abscissa in Fig. 2 is in units of 100 milligram hours when the radium is at the various indicated distances from the film. Thus for a radiograph through 6 in. of steel at 18 in. an exposure time

of 10,000 milligram hours would be required, or 10 hr. with one gram of radium, 20 hr. with a half gram, and so on (a). Knowing these data a practical problem may be immediately attacked.

Convenience and Simplicity of Gamma Radiography

Besides the possibility of radiographing very thick sections, the outstanding feature of this new method is its simplicity and convenience in operation. This may best be shown by some photographs of actual experimental arrangements. In Fig. 3 the radium is placed in a small glass funnel and surrounded on all sides by objects. Fig. 4 shows the complete portability of the method; the piece radiographed is an arm on a forge press. No effort had to be made to transport the arm to a laboratory—it was radiographed "in place."

In Fig. 5 the radium is mounted on the top of a

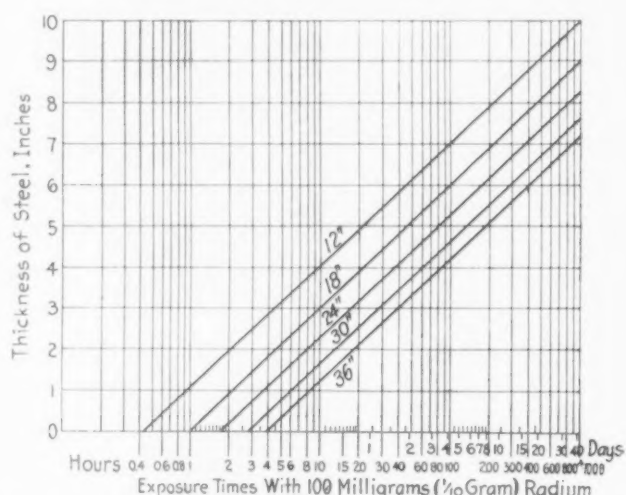


Fig. 2—Method of calculating exposure time for various types of radiographs.

tripod in the center of a cast steel gun slide, 4 in. in wall thickness. Some 50 radiographs could have been taken with one exposure of this piece.

These examples show the complete portability and simplicity of the apparatus. The inspection of a questionable weld on the top of a skyscraper would obviously be a simple task. The opportunity for simultaneous radiography makes it possible to decrease the exposure times very appreciably.

Radiographs of Varying Sections Possible

But now let us turn to some radiographs and see what results may be obtained. Fig. 6 is an X-ray radiograph of a small steel casting, 12 in. in length varying from $\frac{1}{4}$ in. to 1 in. in thickness, with sand inclusions. Note the great contrast shown, but also note that the end sections, much thicker than the rest, are

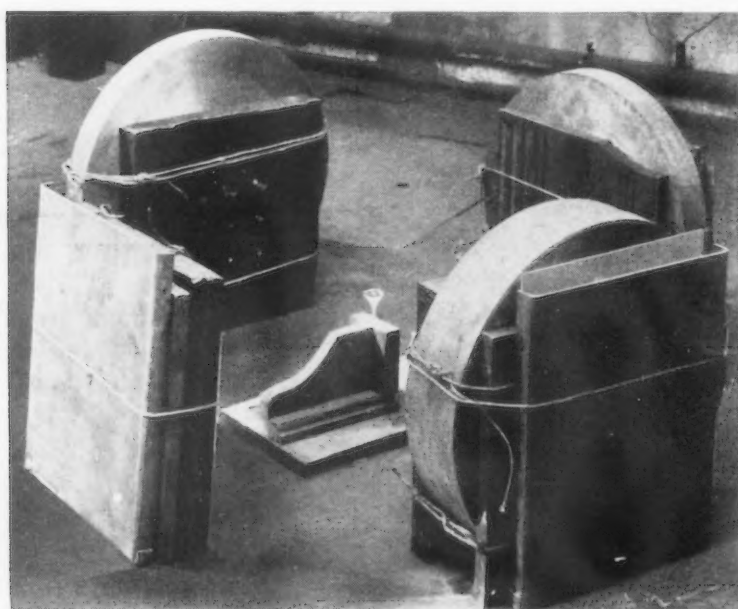


Fig. 3—Radium is placed in a small glass funnel surrounded by objects to be examined.

(a) These exposure times represent what is necessary with Eastman duplitized X-ray films with enhancing screens of lead foil. A research program is now under way, the object of which is to discover films which will decrease these exposure times. Preliminary results indicate that films will be prepared decreasing these exposure times by 20 to 25 per cent. It is hoped that this improvement in speed may reach as high as 50 per cent saving in exposure time.

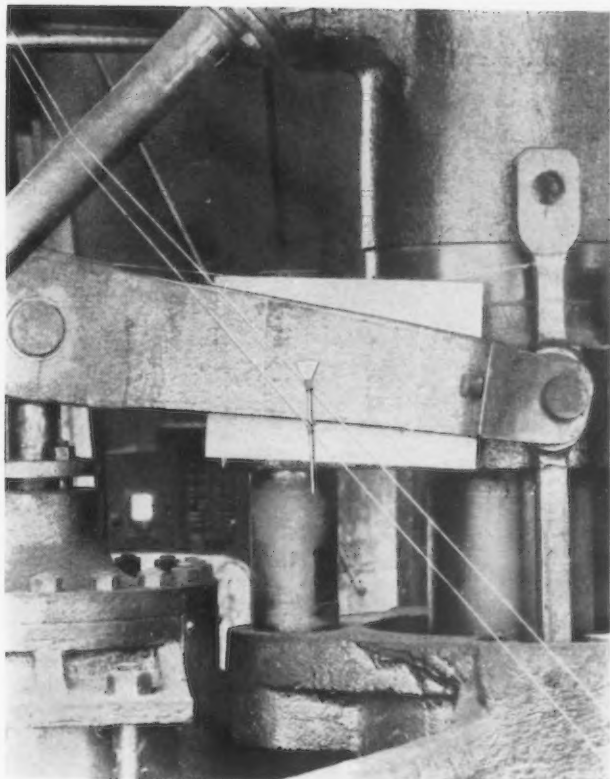


Fig. 4—An example of the portability of the method—arm of a forge press to be radiographed.

under-exposed. Fig. 7 is a gamma ray radiograph of the same piece. Here it will be noted that the contrast is less, the film "flatter," but a study of these two radiographs shows that every defect shown on the X-ray film is also registered without fail upon the gamma ray film. Furthermore the end-sections are now also satisfactorily exposed. In fact, this diminished contrast, an inevitable corollary of a shorter wave-length, makes it possible to obtain satisfactory radiographs of greatly varying sections of steel with one exposure.

Sensitivity a Marked Advantage

The sensitivity of the method for the detection of small defects is of immediate interest to the practical man. To obtain information on this a special radiograph was prepared. The object in Fig. 8 was a pile of steel plates 4 in. in total thickness into one of which was cut a series of slots. Slot No. 3, quite distinctly seen on the original radiograph, was 1 mm. wide and 2 mm. deep; its depth was only 2 per cent of the total thickness. It is obvious that the sensitivity is entirely satisfactory.

Now radiography has two natural fields of application, that of steel castings and that of welds. Most of the radiographs we have prepared were taken of steel castings, but the general characteristics of these radiographs may be easily interpreted for welds.

Defects Detected in Steel Castings

Our laboratory was called upon to prepare some radiographs of a defective 9-ton casting located in the

(b) All of the radiographs shown in this paper were taken from very poor castings; the stern post casting was extremely poor. It must not be concluded that all castings are this bad, nor indeed that all parts of the castings shown here are equally bad; even the stern post casting was entirely satisfactory on many if not most of the radiographs taken.

stern post of one of the new 10,000-ton cruisers. This casting had developed a crack after installation, which was promptly welded. Some uncertainty of the remainder of the casting existed, however, and representatives of our laboratory took some radiographic films when the ship was in dry dock (b).

The films were attached lightly to the side of the casting. The thickness of steel was only $1\frac{1}{4}$ in. In one case eight radiographs were taken simultaneously with a total exposure time of about $1\frac{1}{4}$ hr. These radiographs revealed an extremely bad condition. It was quite obvious that the steel was poor, for there were many blowholes revealed and the general appearance was dirty. The square marking in the center of one radiograph showed a depression, easily visible on the surface, made by a chaplet. Around this square there was a circular crack, with cracks radiating toward the center. In Fig. 9, one of these, there is evidently a "blow" condition of the casting, but chiefly a long irregular crack, apparently a hot crack. A crack some 20 in. long was found by another radiograph.

After some 25 radiographs of this sort were prepared, indicating poor quality on the side of the casting on top during pouring, the cruiser put to sea, and during trials, split the casting around, letting in the sea. The ship then went into dry dock for a long period of time in order to install a new casting, and an immense expense was incurred in putting the ship into commission again.

The moral is obvious: Had this casting been radiographed immediately after manufacture it would certainly not have been installed on the ship and time and money would have been saved.

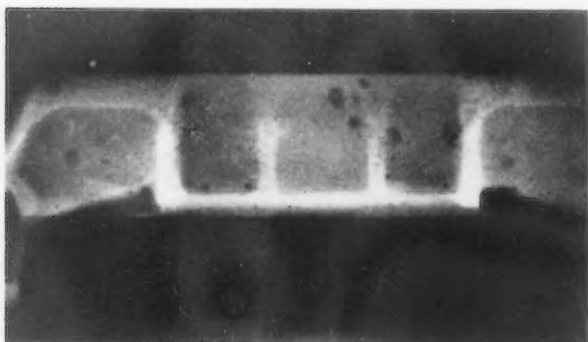
A somewhat similar problem for radiography was presented to our laboratory shortly after the stern post casting. The object was a casting known as the keel knuckle casting, likewise for the cruiser. It was a large casting with greatly varying section, running up to 9 in. in thickness. Two radiographs were taken on this casting. The section in this ran from 2 in. to 7 in. A long jagged crack was revealed in a section 5



Fig. 5—Radium mounted on the top of a tripod inside a cast steel gun slide of 4-in. wall thickness.



Fig. 6 and 7—Upper radiograph (Fig. 6) is an X-ray picture of a small steel casting. The other is a gamma ray radiograph of the same piece.



in. thick. The metal was found to be in very poor condition with a host of serious cracks, the thickness varying from 7 in. down to 3 in.

Although the interest in radiography of those present at this meeting is chiefly in welding, these radiographs of casting have been shown because they illustrate the general features of the method, general features which are as applicable to welds as to steel castings.

Practically, the important point to make is that the work on the stern post casting could not have been done by any other method, for it was necessary to do the work under the ship and in a dark dock. This represents, then, the advantages resulting from the complete portability.

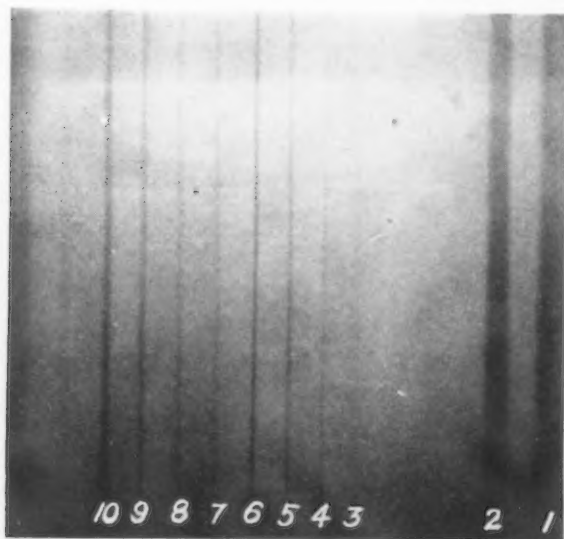


Fig. 8—Pile of steel plates, 4 in. in total thickness, in one of which a series of slots was cut. Slot No. 3, only 2 per cent of total thickness, is visible.

The steel knuckle casting, on the other hand, represents a trial of the method for the detection of defects in ranges of thickness beyond the X-ray limit, and again it might be said that no other method would have been so useful.

But now let us turn to some welds. In general it is more difficult to prepare photographic copies from radiographs of welds than of castings; the defects sought are more lightly represented on the film. The first, Fig. 10, is an old one, showing a lap weld with lack of fusion. The two plates welded were $\frac{1}{2}$ in. in thickness. Fig. 11 is a rather badly porous butt-weld in a 1 in. plate. Such a weld obviously would be immediately rejected. Fig. 12, however, shows a satisfactory butt-weld, again in a 1 in. plate. Although

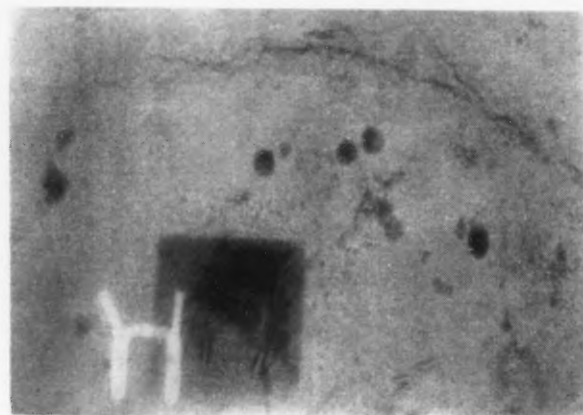


Fig. 9—Blow metal and a long irregular crack in a stern post revealed by gamma rays.



Fig. 10—Gamma ray radiograph of a lap weld with lack of fusion.

some slight porosity is indicated the weld is generally quite acceptable.

In general it may be said that gamma rays give equally as good results on welds as on castings. In cases where portability is a requisite, the method will doubtless find its application.

Naturally it is still too soon to say exactly what place it may attain among non-destructive testing methods. The obvious advantages in great penetration and complete portability certainly seem to justify the careful consideration of industry. The Navy has naturally been the first in the field and has made the most extensive study of the method. Its success has been sufficient to justify the Navy in purchasing a stock of radium in order to inspect castings and welds in the various Navy Yards and also to continue to study the method itself.

No application of the method has as yet been made in the industrial field, though in several instances this



Fig. 11—Porous butt-weld in a one-inch plate shown with the gamma ray.



Fig. 12—A satisfactory weld in a one-inch plate revealed by the gamma ray.

is awaiting only the development of suitable arrangements for making radium available for the work. Naturally, since this method is entirely new, some time must elapse before such arrangements may be

consummated. With the advantages of portability, simplicity, and great penetration, it seems inevitable that industry will add this method to its list of serviceable non-destructive tests.

Principles in Locating Industrial Plants

THE principles of industrial plant location were enumerated in a paper presented by Herbert C. Ryding, president, Tennessee Coal, Iron & Railroad Co., Birmingham, to the American Society of Mechanical Engineers at its meeting in Birmingham. The value of the study will lie particularly in its setting down the many points which should be considered in a problem of the sort. In other words it supplies the abstract analysis which should be available in making the decisions of the concrete case.

Mr. Ryding pointed out that under any circumstances the best location for an industrial plant is where the combined cost of production and distribution of the product can be maintained at a minimum.

Time was, not so long ago, he added, when the geographical location of an industry from the freight-rate standpoint was not of paramount importance, because the carriers could, to a very large extent, adjust their freight rates in such fashion as to overcome or at least very greatly mitigate geographical disadvantages. At the present time, however, the Interstate Commerce Commission enforces firmly the so-called "long- and short-haul clause" of the Interstate Commerce Act, which forbids rates for shorter distances being greater than for longer distances over the same route, and which has the effect of making distance the prime factor in fixing the relationships of rates between points of origin and destination. Added to this, the commission is required to establish rates which will yield the carriers as a whole a fair return on the investment, and is authorized to fix minimum as well as maximum rates, and to prevent discriminatory rates on intrastate versus interstate traffic.

The laws also require that both water and rail transportation be fostered and maintained in equal vigor, and also that rates be such as to permit the development of the country as a whole. The effect of the administration of these laws on the problem of industrial-plant location is to give each commodity a fixed place in the rate structure and to fix the rates from every point to every other point with distance as the main controlling factor.

The hauling of freight on the highways by truck is a new form of transportation that bids fair to disturb seriously the rail rate situation. This form of transportation has grown by leaps and bounds, and is affording the railroads very serious competition. Not only is this matter of grave concern to them, but to shippers and the general public, because of the unknown effect which it is bound to have on the rail service and the rates. The establishment of a proper relationship between these forms of transportation, and their coordination, will require a great deal of thought and labor.

Schedules of essential factors in determining the section of the country in which to locate and then in determining location in city, suburban or rural district featured the paper. Reference also was made to a survey of industrial development in the United States and Canada made by the National Electric Light Association and the Metropolitan Life Insurance Co. This contained a statement as follows: "It is significant that bonuses, free taxes, free land, or free factory buildings, which inducements at one time were frequently offered, and still are from time to time, did not appear among the three reasons most frequently advanced for the selection of the location of a plant."





SURVEYING his work—the workman of today, like the craftsman of old, takes pride in a job well done. Human nature doesn't change. All that he expects is that his proficiency be recognized by the management. This is best accomplished by compensation according to performance, the principle underlying incentive systems. ▲ ▲ ▲

1656—*The Iron Age*, May 21, 1931

COST CONTROL AND WAGE INCENTIVES EFFECT SAVINGS



MANY large metal-working plants have installed cost control and wage incentive systems that have worked with varying degrees of success. A number of different systems are in vogue, the application of which has been described in articles published in *THE IRON AGE* from time to time. Among the outstanding companies which have adopted such systems are the Otis Elevator Co., the American Can Co. and the Cincinnati Milling Machine Co., to mention only a few in varied lines of metal-working industry. The Monarch Machine Tool Co., Sidney, Ohio, has given a thorough trial to the Dyer system, which is that employed also by the Otis Elevator Co. and some other large organizations.



A COST control system, including a wage incentive plan, under which 94 per cent of its employees are paid according to work produced is being used by the Monarch Machine Tool Co., Sidney, Ohio, which has found the system highly efficient in effecting plant economies. The effort of labor is measured by a scientific plan, direct and indirect payroll expenditures are controlled, and the work of foremen is measured by their ability to control costs and furnish leadership. These measurements and controls provide bases for planning and scheduling production for regulating payroll expenditures and manufacturing costs. The system, known as the Dyer system, was installed by Dyer Engineers, Inc., Cleveland.

A production control system has also been installed as a part of the company's scheme of management. Efficiency also has been increased by the elimination of old equipment. There is not a machine tool in the plant more than three years old. Labor is saved when possible by having one man operate two machines of a type that usually had an individual operator.

As a basis for control of both direct and indirect payroll expenditures, a common denominator designated as a unit is used. A unit is a standard minute of quality work, including a fraction of a minute for relaxation. Standard data are obtained and standards are set up. These standards are compiled from elementary weighted values derived from motion and time studies. A weighted value is the time value se-

cured by stop watch studies and adjusted to standard effectiveness, and to this is added a percentage for relaxation, according to the type of elementary operation performed. In both repetitive and non-repetitive operations the total of weighted values of elementary motions furnishes the standard.

By setting up standards through a system of scientific analysis, work often regarded as unmeasurable is measured, permitting a greater number of employees to be placed under a wage incentive system, accuracy is claimed because standards are set up with mechanical precision, and danger of favoritism is eliminated, as standards are often set long before they are actually applied.

Each Department Has Its Own Standard of Costs

A standard of costs is set up for each department. In the preparation of a departmental standard, the first thing that the management desires to know is how much can be produced in the department and how much it should cost. Actual production and costs are compared weekly with the standards that have been established in such detail that a busy executive can see by glancing at a cost control analysis how near to the standard the department has approached and the reason for excessive cost, should there be any. This cost control analysis is a complete summary of production and costs in the entire plant. There are 14 of these analyses, one for each department, start-





ing with cleaning rough castings and ending with the shipping room.

Under this system a man's time is divided into minutes on standard or measured minutes, day work, waiting time and P.N.P. or producers' non-productive time. Measured minutes cover the time which one operator spends on work, on which a set time has been allowed. If the work is productive, it is classed as black units. For all unnecessary work, or work that could have been avoided, the operator is given credit for red or non-productive units. The foreman is given credit for only productive or black units and is held responsible for all non-productive work done in his department. Red or non-productive units are allowed to operators whenever the raw material is not up to standard. Standards are always set for the particular machine and tooling that will produce the operation in the shortest time. If the routing cannot be followed for any reason, operators are allowed extra time or non-productive units in order that they may have the proper incentive to perform a day's work. By keeping this classification, the management is continually informed of every phase of shop activity, and, when costs are above standard, if due to unbalance of equipment, material control, upset of schedules because of quick deliveries or other causes, the information necessary for economical production is available.

When units produced are in excess of minutes spent, the difference is recorded as premium units and men are paid accordingly. When the minutes spent are in excess of units produced, the difference becomes a loss or waste and is known as measured units to equal 60, or expressed Meas. U = 60.

It is recognized that a greater volume of work can be produced under standards. Therefore, when a standard is not set for the job, a certain portion of the time is regarded as waste, and called day work units to equal 60, or pressed as DW U = 60.

Employee Gets Premium for All He Saves by Increasing Output

The wage incentive plan is based on the payment of a base hour rate plus a premium based on costs per 100 units produced, which is approximately what an employee receives at his hourly rate for making the same number of units that he produces in excess of the set standard; or, in other words, he gets all he saves in time by increasing his output. If the set time for a piece calls for an output of 10 pieces per hr. and a man produces 15 pieces, his premium for the five extra pieces is approximately his hour rate for 30 min.

There is no benefit to the company in labor cost due to an increase in the employee's production over 60 unit hr., as there is no reduction in the labor cost per unit, the only gain to the employee being the gain that results from an increased output without an increase in overhead. In other words, the labor costs for a piece are the same whether a man maintains or exceeds the 60 unit hr. rate.

Experience of the company indicates that, to provide the necessary incentive for increased effort, an employee should be offered a premium of 25 per cent over his daily pay. While the set standard of performance is 60 units per hr., representing normal effort, the standards indicate that an efficient employee should produce 75 units per hr., and the plant capacity is rated on that basis. This allows a man 25 per cent in bonus above his daily rate. If a man spoils work, it is taken from his future premiums at

THE MONARCH MACHINE TOOL COMPANY														DEPARTMENT _____	
PAY ROLL SHEET														WEEK ENDING _____	
Employee Number, Department, etc. (20-10-100)															
DATE	DATE	DATE	DATE	DATE	DATE	DATE	DATE	DATE	DATE	DATE	DATE	DATE	DATE		
C. L.	P. N. P.	Work on Standard	C. L.	P. N. P.	Work on Standard	C. L.	P. N. P.	Work on Standard	C. L.	P. N. P.	Work on Standard	C. L.	P. N. P.	Work on Standard	Time
Per Sec.	Per Sec.	Per Sec.	Per Sec.	Per Sec.	Per Sec.	Per Sec.	Per Sec.	Per Sec.	Per Sec.	Per Sec.	Per Sec.	Per Sec.	Per Sec.	Per Sec.	NAME
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FIG. 2—A daily record, designated as a payroll or posting sheet, is made up. It contains an analysis of every man's record, and is posted ing day. This record shows whether a man is entitled

◆ ◆ ◆

[illegible]

Dept. <u>Lath.</u>					Oper. No. <u>66.</u>							
Date <u>March 4 1930</u>					Oper. Name <u>John Jones.</u>							
Lot No.	Part & Oper. No.	Name of Part or Description of Oper.	No. of Pcs.	Std.	UNITS		Start Time	Elapsed Time	Mins on Std.	D. W.	P. N. P.	Walt
					Red	Black						
87	A1422	Hand gear setup					20	700	15	15		
87	"	" <u>oper #1</u>	40	12			48	715	45	45		
87	"	" <u>setup oper #2</u>					15	800	10	10		
87	"	" <u>oper #2</u>	40	2.0			80	810	65	65		
87	"	" <u>setup oper #30</u>					20	915	15	15		
87		<u>oper #3 only 1 hr</u>	40	1.5	20	60	930	60	60			
63	B14	<u>finish complete</u>		DW			1030	180		180		
63		<u>clean chuck</u>					230	20			30	
54	C68	<u>Setup oper #1</u>					15	300	10	10		
54	C68	<u>oper #1</u>	60	2.0			120	310	110	110		
							500					
DEDUCTIONS												
Purchasing		Engineering		Castings								
Mins	Units	Mins	Units	Mins	Units							
20 378							540	330	180		30	
NOTATIONS:												
												SET UP
												Units—
												Mins—

[illegible]

Bonus earnings are computed as follows: Suppose a man's hour rate is 70c., which is equivalent to 117c. per 100 min. In computing his premium, a deduction of 15 per cent is set aside to compensate non-productive men. That reduces the basis on which his premium is computed to 99c. per 100 min.

Weekly and Monthly Reports Sent to Every Foreman

Fig. 1 shows a copy of the analysis for a department with one month filled in. The first column of figures indicates the total number of units produced. Only productive or black units are included in the total, scrapped work and red units having been deducted, leaving the net salable production for the specified pay period. The figure at the top of the column, 125,000, is the standard capacity for the month.

The Iron Age, May 21, 1931—1659

[illegible]

at noon each day in every department, giving a record of the preceding day's work, pointing out the laggards, and pointing out the men who are doing better than the others.

SHEET NO.	Card No	Req.	MIN.	DATE	7/2
No. OF SHEETS	352	Max.	Order	ORDER No.	1
UNIT NO.	UNIT NAME			SALES	366
Model No	Sub Assembly 2			Units Stock	
BIN No.	Hel Rod Head			Units in Proc	10
PART No.	PART NAME			In Stock	40
B.P. No.				In Process	0
				Rough Store	0
				Mat. on order	0
				In Stock	1040
4-938	Lock Collar			In Process	50 7/14/31
1-1286	steel			Rough Store	
				Mat. on Order	
				In Stock	
4-951	Dog Plate			In Process	(5939-50)
1-1287	Cast iron			Rough Store	
				Mat. on Order	3/4/31-5220-50
				In Stock	
				In Process	
				Rough Store	
				Mat. on Order	
				In Stock	
				In Process	

FIG. 4—A material control or record sheet is the key form in the operation of the production control system. One of these is used for every sub-assembly.

man working 49½ hr. per week, less time for oiling every morning and for cleaning up at the end of the week and producing at 75 unit hr. rate. No allowance is made for unnecessary work and for an out-of-balance condition of machinery. Percentage on standard is the percentage of the measured work to the total minutes spent by productive men in the department.

The payroll is divided into productive, waste and non-productive labor. The productive payroll is the amount spent for true productive work. Waste payroll includes day work units to give recognition of the reduced efficiency of day workers, measured units = 60, or lost time units due to working at a sub-standard rate and waiting time, these being valued on a standard cost basis. The non-productive payroll includes all contributory labor such as foremen, sweeper, trucker and checker and also producers' non-productive work done by productive men and non-productive labor valued at the standard cost. The total payroll is the total of the three items enumerated and includes the pay of all labor used in the department. Productive, waste and non-productive costs are distributed on the basis of actual facts and represent the cost of productive effort, cost of idleness or its equivalent and the cost of contributory effort respectively.

Cost per 1000 units are similarly broken up into productive, and into waste and non-productive costs that represent the cost in excess of the standard per 1000 units for productive effort, due to wasted time and contributory effort, and in addition there is a column for excess productive cost, which is the difference between the standard cost shown at the head of the column and the actual production cost. This excess productive cost is the result of rates in excess of standard rates and extra payment due to overtime. Waste and non-productive time are always valued at standard cost, and this extra shows up as an excess productive cost. In other words, excess money spent for waste or non-productive time is indicated in the productive cost figure. Total cost per 1000 units is obtained by dividing the total payroll by the number of thousands of units produced.

If the cost per 1000 units goes down, the payroll cost must go down, and, if the cost of the product goes up, the payroll cost shows an increase.

Effectiveness of the control is shown in the two columns under the heading "Cost Control Factor." This factor is the ratio between standard and actual expense and grand total cost per 1000 units. The total cost control factor is obtained by dividing standard costs by actual costs, and the expense factor is obtained by dividing standard expense total by actual expense total.

The operators' unit hour denotes the speed at which the operators are working. If this figure is near 75, the management knows that the operators are doing their part. It is a true mathematical figure and is obtained by dividing the red and black units by the minutes on standard operations and multiplying the quotient by 60. The departmental unit hour formula is:

$$\frac{(\text{black units} + \text{red units}) \times 60}{\text{minutes on standard} + \text{measured } U = 60 + \text{waiting time.}}$$

It can be seen that measured $U = 60$ and waiting time reduce the department unit hour. Both of these are under full control of foremen and the department unit hour is considered one of the good measures of supervision.

The supervisor's unit hour is obtained by dividing the units in excess of 60 of the departmental unit hour by the expense cost control factor and adding 60. It is another figure designed to tell at a glance the effectiveness of the supervisor. If there are no $U = 60$ or waiting time in a department, the departmental and operator unit hour will be the same. If the expense cost control factor is perfect



or down to 1.00, the supervisor's unit hour will be the same as the departmental.

Daily Records Posted at Noon in Every Department

A daily record, designated as a payroll or posting sheet, is made up containing an analysis of every man's record. This, shown in Fig. 2, is posted at noon in each department and gives a record of the previous day. It tells the foreman promptly what was accomplished, and from it each man learns what he and his fellow workers did and what they earned in premiums. It gives the man's name, clock number, time spent on contributory labor, producers' non-productive labor, waiting time, day work time, black and red units produced and premium for the day. A summary is made up at the bottom. This record indicates to the foreman whether men are producing as much as they should. Also, it furnishes the management a graphic record of a man's unit hours, shows whether a man is entitled to higher base wages, and points out the laggards, the latter information being of value in the selection of men to be laid off in dull times. The posting sheet is summarized at the bottom of the sheet and furnishes the data for the cost control analysis.

A man's daily time card is shown in Fig. 3. This lists various operations, the aggregate time spent on standard work, day work and producers' non-productive work, all amounting to 540 min. or 9 hr. The man produced 398 units in 330 min. spent on standard work or 68 premium units, for which he is paid in addition to his day rate. The daily time card is made out by a checker and goes to the production department, where it supplies data for the daily posting sheet.

From 10,000 to 12,000 parts are required for the nine models and sizes of lathes made, and these take 50,000 to 55,000 operations, each of which has been time studied. Standard data, compiled from these studies, are used for setting the time of all operations except on the assembly floor, where time studies instead of standard data are used for all operations except scraping. The system has not involved much added expense, as the work is done by two time-study men in the production department

and a third in the tool room, where most of the work is non-repetitive.

Time studies have been made of various times that go to make up an operation, and these have been combined into standards for every machine and for parts of all weights and shapes. The use of various methods of computation has made possible the setting of a time for practically all classes of work. Plain cylindrical grinding is computed on a cu. in. basis, drilling is on an r.p.m. and feed basis, milling is based on so many thousandths cut per tooth, planing is based on feet per min. at a given feed per stroke and gear cutting is based wholly on a handling time basis, no cutting time being allowed. Neither is cutting time allowed for cutting off saws, a flat time based on standards being used. For cleaning, sand blasting and painting there are standards derived from an area basis and reduced to a price per piece.

Foremen, tool makers, sweepers, truckers, checkers, time-study work, typing and filing all come under the bonus system. Stenographers are allowed a bonus based on so much per letter plus so much per 1000 strokes which are computed with counters on the typewriters. A foreman's premium is based on the cost per 1000 units in his department as shown by the cost control analysis sheet, the rate differing with different foremen. Bonus for sweepers and truckers is computed in the same way as for foremen, but at a lower rate.

It is expected that the system, after sufficient use to give it a thorough test, will enable the management to control costs, know what costs should be and find the cause if they are too high, and will develop higher efficiency throughout the plant, improved quality of work and less spoilage because men are penalized for scrapped work. It also enables the foreman to know more about the men under him and their work. For the men the wage incentive feature is an advantage because not only are they paid according to their output, but an opportunity for advancement is afforded the best producers.

The first detail in connection with the adoption

PART NO. <i>A-951</i>	AMT. ORDERED <i>50</i>	LOT NUMBER <i>Nº 5939</i>
PART NAME <i>Day Plate</i>	MATERIAL <i>CB</i>	
DATE ISSUED <i>3-5-31</i>	DATE WANTED	REMARKS <i>Factory Order</i>
UNIT NO. <i>1-1</i>	BIN NO. <i>1-1287</i>	<i>Reg-5220</i>

FIG. 6—In case an order is to be entered through the purchasing department, such as for a rough casting, this requisition form is used. It shows part number, name, material, and quantity ordered. Space is provided for delivery dates.

FIG. 5 (at left)—A factory order sheet is used for ordering parts for each assembly. This sheet gives part number and name, lot number, number ordered, number of unit of which the item forms a part and the bin number.

PART NUMBER <i>A-951</i>	QUANTITY <i>50</i>	REQ. NO. <i>Nº 5220</i>
PART NAME <i>Day Plate</i>	UNIT NO. <i>1-1</i>	ORDER NO. <i>1567</i>
RECEIVED		MATERIAL <i>CB</i>
DATE	RECD TOTAL	DATE REQUIRED <i>3-5-31</i>
<i>3/7/31</i>	<i>10 10</i>	DATE ORDERED <i>3-6-31</i>
<i>3/8/31</i>	<i>10 20</i>	DATE REQUIRED <i>50</i>
		VENDOR <i>5939</i>

Cord No 352		Keep Tag		With Work	
Part No. <i>Size</i> <i>1 1/2"</i>	Amount <i>10</i>	Size <i>16</i>	Order No. <i>1</i>		
Part Name <i>Wet Grd Headstock</i>					
Material <i>UNIT No</i> <i>1-1</i>	Weight	Date Ordered <i>9-5-31</i>	Date Wanted		
Oper. No.	Operation	Premium Each	Set Up		
1.		<i>Unit Assembly order sent</i>			
2.					
3.					
4.					
5.					
6.					
7.					
8.					
9.					
10.					
Amount Finished		Storekeeper			
RETURN THIS TAG TO COST DEPARTMENT WHEN FINISHED 11 11 29					

of the production control system is the preparation of a sales forecast for the year. In making this for the current year, sales during 1930 were compared with those in 1929. A list of all machines sold was broken down into different models and into different sub-assemblies and attachments. An analysis of this list and a comparison with a corresponding list for the previous year showed the trend in the demand for types and sizes of machines and attachments and supplied the manufacturer with data that were used in determining quantities of each model and sub-assemblies to be built during the present year.

The results, of course, constitute a tentative sales forecast that is fairly accurate for the first three or four months, which covers a production cycle for a large number of manufactured parts and purchases. The forecasted demand per annum is changed throughout the year as trade conditions warrant.

The production department uses the sales forecast as a basis for establishing economical order quantities, using the following formula:

Order Quantity =

Preparation cost	X	2	X	demand per annum
Value of piece	X	percentage	(See below)	

Standards are set for the set-up of all jobs, so it is an easy matter to pre-determine the cost of set-up.

is placed on the order, and the inspector stamps this number on the machine after it is completed. One copy of this order goes to the production department, one to the superintendent and a third is tied to the lathe and is shipped with it.

The sales and factory order is used by the production department in making up the material control sheet. On this control sheet is listed the sub-assembly under its unit name and beneath are listed the various parts that make up the sub-assembly. Every sub-assembly has a unit number which is

turned to the production department and entered on the material or production control sheet.

The production control sheet reproduced indicates the method of keeping the record. As an example, suppose an order for machines requiring the manufacture of a certain type of head stock has been received and the production department schedules 10 of these head stocks for production. The quantity order is entered on the material control sheet and that number of units is listed as in process. One of the parts is a dog plate and 50 of these are

Final Assembly Card								
No.	Bed on Legs	Bed Aligned	Apron Control	Builders Parts	Mount Motor	Mount Guards	Testers Parts	Pump and Piping
Model No. 0-2626	115-1	215-2	315-1	415	515	615	715	815
Card No. 10	24	21						
Omit Item No. 1-3-5								
Add Items								
Ordered By								
Delivered By								

FIG. 9—A final assembly card is made out as soon as an order is received for a lathe. This is sent to the superintendent, who holds the card until parts are ready for the final assembly.

listed on the left side of the sheet. Beneath in the same column are listed the blue print number, the part number and the number of the bin in which the part is carried in the stock room.

The data listed on the right side of the production or material control sheet comprise a rough and finished material record and serve as a guide to the production department in ordering production. They also serve as a perpetual stock inventory. At the top of this record is listed the order number and beneath it, in the small squares, are shown the sub-assemblies in stock and in process, the parts in stock and in process and the material for each in rough stock or on order. A separate column is used for each machine order, i.e., if an order is received for 10 duplicate machines, each would be listed separately in one of the vertical columns.

How the Factory Order Is Handled

A factory order is made in duplicate for the quantity of each part to be made. A copy of this goes to the engineering department to obtain the blue print and then on to the standards department for the standards. The blue print and standards then go to the factory with the order. There the pink duplicate of the order is placed in a box on the foreman's desk and the other stays with the parts on the floor. When the part is moved from one department to another both the order and pink duplicate are moved with it, and the pink copy goes to the next foreman's desk. When the order is completed and delivered to the stock room the factory order is re-

ordered on a factory order sheet (Fig. 5), bearing the part number and name, lot number, number ordered, number of unit of which they are to form a part, and the bin number. In this case a material requisition (Fig. 6) was issued to the purchasing department for the rough casting. This shows the part number, name, material and quantity ordered and space is provided for entering deliveries. A pink duplicate of the requisition is filed in the production department for following up deliveries. The original requisition is returned to the production department, and the castings as received are entered on this blank. When shipments are completed the factory order is released.

When parts for a sub-assembly are finished, a unit assembly order card (Fig. 7) is filled out and sent to the assembly foreman, and he withdraws the required stock from the finished stock room. All parts used on each unit are listed on an assembly withdrawal card (Fig. 8), copies of which are kept by the production department, stock room and assembly foreman. The stock room uses this production record for issuing parts against the unit assembly order card. After the assembly is completed, the unit assembly order card goes back to the production department and the proper entries of units in stock are made on the material control sheet.

When an order for a lathe is received, a final assembly card (Fig. 9) is made out and sent to the

(Concluded on page 1698)



THREAD gages are checked for angle, lead and pitch diameter in one setting on this universal measuring microscope. Readings to one-hundred thousandth of an inch are obtainable. ▲ ▲ ▲

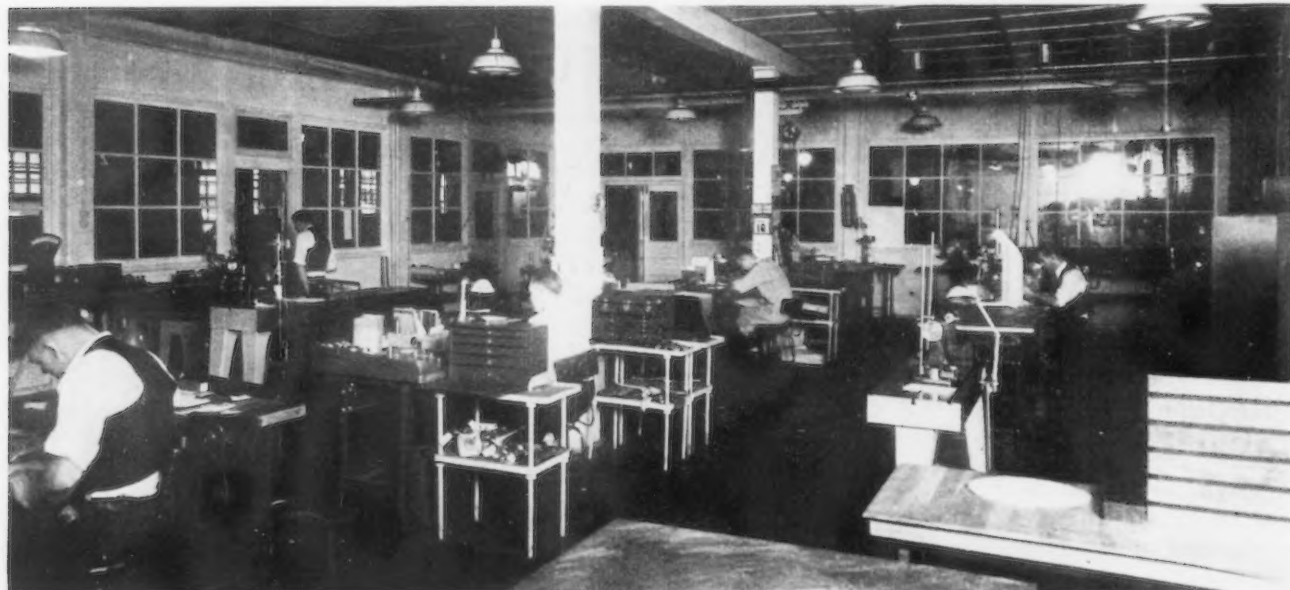
SPECIAL TOOL INSPECTION DEPARTMENT AT REO PLANT

THE personal element in making fine measurements of tools has been eliminated and the possibility of disputes between departments over the acceptability of work removed by the recent action of the Reo Motor Car Co., Lansing, Mich., in establishing a standards division which maintains the standard of accuracy for the entire plant.

All commercial tools, that is, tools bought from outside sources, are sent to this division from the receiving room to be passed upon before going to the stockroom. Likewise all work turned out by the company's toolroom must be inspected and accepted by the division before it is used. This method abol-

ishes the practice of a department passing on the merits of its own performance, such as the toolroom inspecting the tools which it makes.

Prior to the creation of the standards division the inspection of jigs and fixtures was under the supervision of the superintendent of the toolroom and the inspection of gages and tools under the factory inspection department. This division of responsibility was terminated by the substitution of the standards division, the personnel of which consists of a superintendent, jig and fixture inspector, gage inspector, gear specialist and tool inspector. The jig and fixture inspector and the tool inspector



each have an apprentice. The jig and fixture apprentice spends two and a half months in the department before completing his course of training and becoming a tool maker. The gear specialist picks out the master gears and checks the gear hobs and gear cutters.

The standards division is well equipped with precision instruments. On all jobs where limits are less than 0.001 in., indicating micrometers are used not only in the division itself, but also in the factory for checking work in process. There are some 60 Zeiss passameters distributed about the factory and in constant use under the supervision of the foremen in the production departments. There are two optical dividing heads, one in the standards division and the other in the toolroom.

Among the measuring devices in the standards division are an improved optical universal bevel protractor, optical division testing machine, optical gear tooth caliper, horizontal optimeter, inside indicator gage, universal measuring microscope and the usual sets of Johansson and Hoke gage blocks. Largely on account of the difference in shape between the Johansson and Hoke instruments, it has been discovered that both have their own applications, and under the circumstances the investment in both is justified.

Whenever the standards division rejects a tool, it makes out a rejection slip which accompanies the tool. If the job has been done in the company's toolroom, the material goes to the salvage department; otherwise, it is returned to the vendor. The superintendent of the division makes a monthly report to the factory manager, describing the work which has been done and future plans. This is frequent enough to maintain satisfactory supervision over the division's activities.

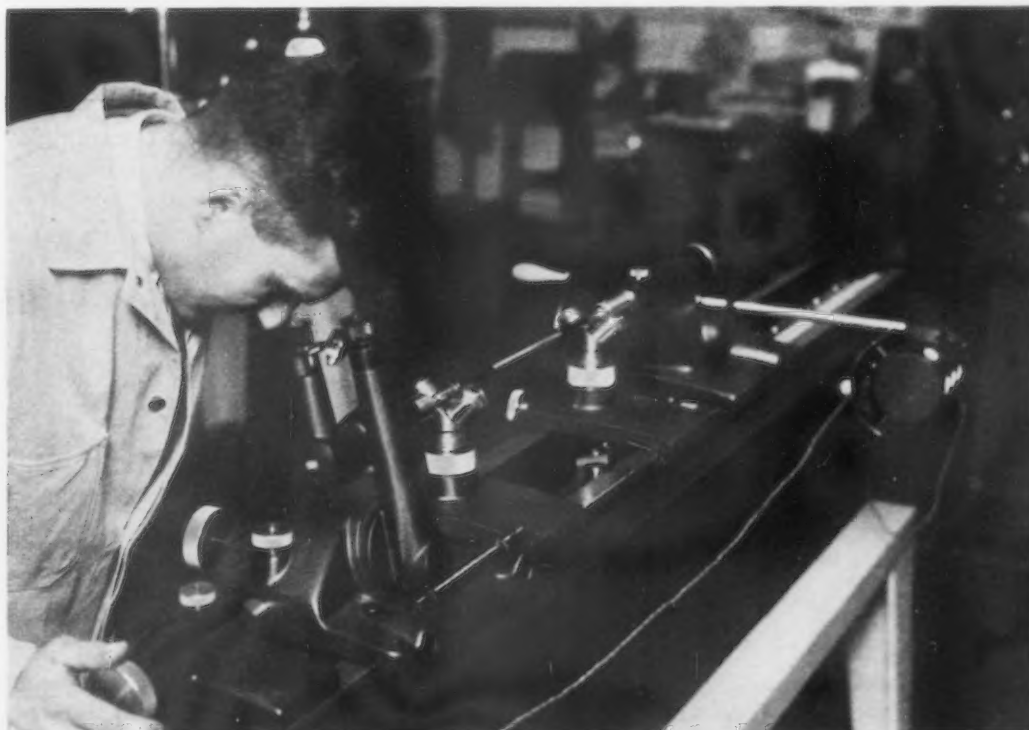


MEASURING pitch diameter of tap by three-wire method with Zeiss indicating micrometer. The dial gage reads in plus or minus 0.0001 in.

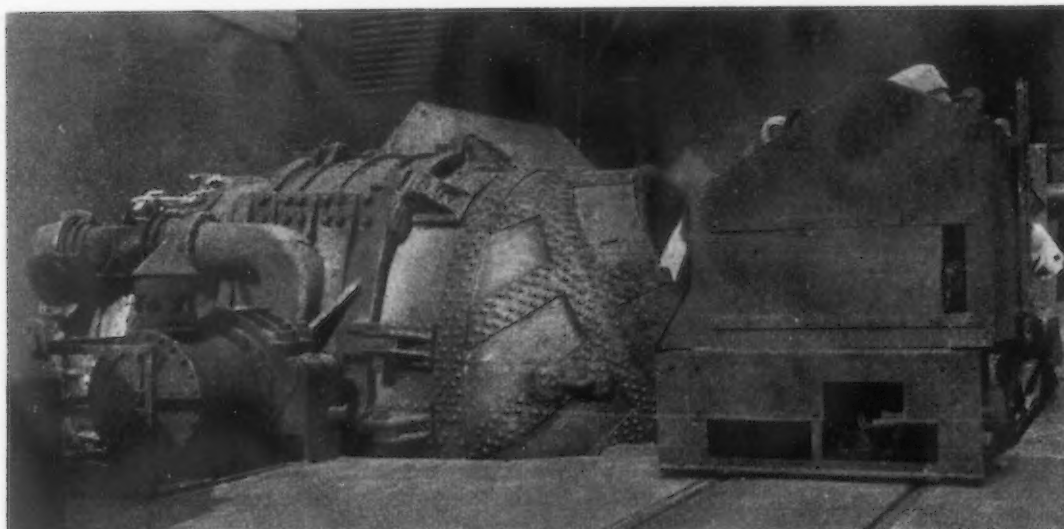
The standards division is saving the company money, time and labor compared with the former system. It has done even more, as it has increased efficiency and removed the cause for irritation between manufacturing departments by relieving them of inspection duties.

▲ ▲ ▲
CENTRAL standards division of the Reo Motor Car Co., (at left). Here all tools, gages, and jigs and fixtures are passed upon before use.

◆ ◆ ◆
PIN gages may be checked on this Zeiss length measuring machine. No master gage blocks are required for setting.



NEW STEEL-MAKING EQUIPMENT



POURING hot metal from 35-ton ladle into converter prior to blowing. Ladle is controlled from a distant station, lights serving to indicate when the ladle is properly spotted.

THREE 25-ton converters, two 800-ton hot-metal mixers and three 250-ton tilting open-hearth furnaces comprise the main units in the new steel plant of the National Tube Co. at McKeesport. These have taken the place of three old 9-ton converters and one 200-ton mixer, now scrapped, thereby greatly augmenting the capacity of the plant and just as greatly increasing the flexibility of operation. The new steel-making equipment was built by the Pennsylvania Engineering Works, New Castle, Pa.

It was designed for use either as a straight open-hearth plant or for duplex operation, in which the partly blown metal from the converters is finished in the open-hearth furnaces. The plant makes also a considerable tonnage of Bessemer steel to fill orders calling for that grade of material. It can readily make straight open-hearth steel by the scrap and metal process, as desired. The first heat of steel was made on Dec. 29 last.

The new steel-making unit has a length of about 1800 ft. along the Monongahela River bank. This carries it from the mold yard and blower house at the west end to the skull cracker and stockhouse at the east end.

Stretching along this area, in order east of the blower house, are the scrap yard, open-air converter bay, mixer house, open-hearth building and stockhouse. The mold yard and stripper building are

south of the converter bay, with a ladle repair house between. The converter bottom house is just north of the mixer building.

Space for gas producers has been reserved north of the open-hearth building, but the producers have not yet been built, as coke oven gas and tar are now used for fuel. Storage tanks at the northeast corner of the open-hearth building provide considerable capacity for storing tar or fuel oil; while the skull cracker and cinder yard, just north of the open-hearth stockhouse, complete the list of major units of the layout.

A system of signal lights connecting mixers, converter control pulpit and open-hearth floor serves to tell just what heat is being made, or being passed along for further refining.

Mixers Completely Safeguarded

An unusually complete interconnection of safety devices has been adopted in the mixer house. Each mixer is tilted from an independent pulpit. A square platform about 2 ft. each way, at the point where the operator stands in handling his operating levers, is connected by mechanism below with a ratchet and pawl at the bottom of the mixer. The pawl is held by the force of gravity tightly in the ratchet, except when the operator's small platform is depressed by his weight standing upon it. This releases the pawl and permits the mixer to be turned down.

AT NATIONAL TUBE CO. WORKS

FLEXIBILITY in operation, both as to what is made and how much can be made daily, features the new steel-making plant of the National Tube Co. at McKeesport. Such portions of the old works as could be employed were retained, with considerable changes, but most of the equipment, including all of that used in making the steel, is new. This plant feeds mills making pipe by all the present approved methods—lap-weld, butt-weld, seamless and electrically-welded.

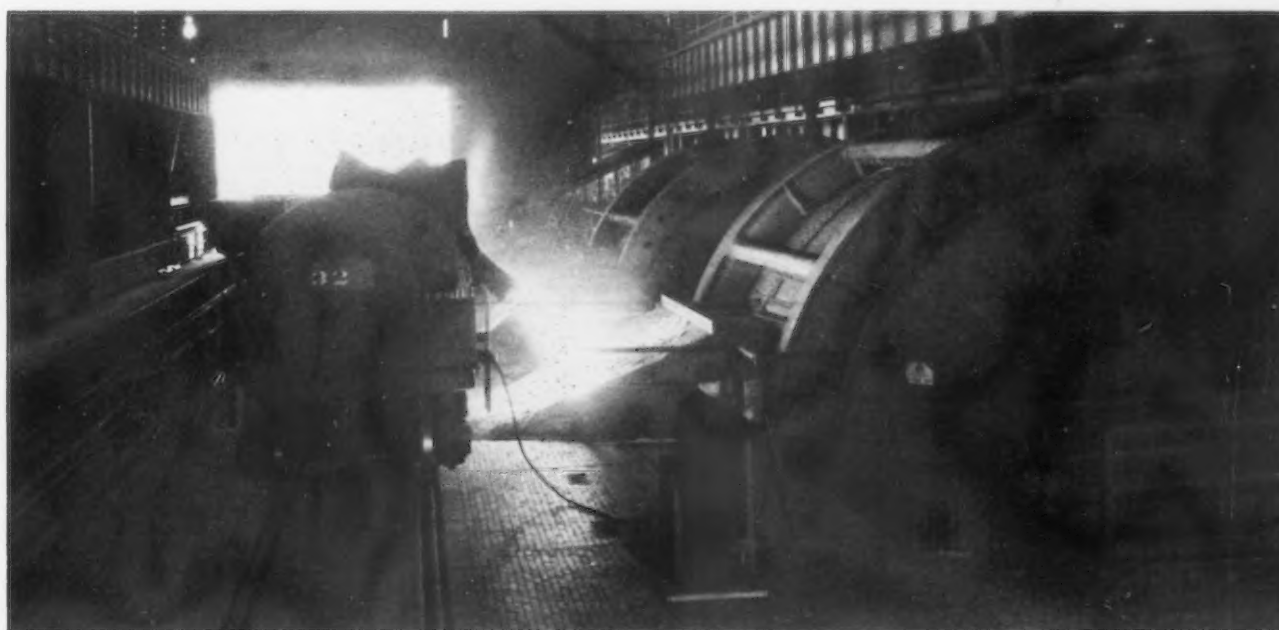
At the same time a safety switch above the man's head must be thrown over before the motor operating the tilting mechanism can function. Hence, there are the two separate safeguards in that the man must stand upon the little platform and, at the same time, throw over the self-returning safety switch before he can dump any metal.

In case of failure of the current or any accident to the electric equipment, an air motor automatically goes into action and tilts the mixer back toward normal. The air storage tank, kept at 100 lb. pressure, has sufficient capacity to raise the spout of the mixer 24 in., avoiding any flow of iron which might otherwise spill upon the floor. As the air is

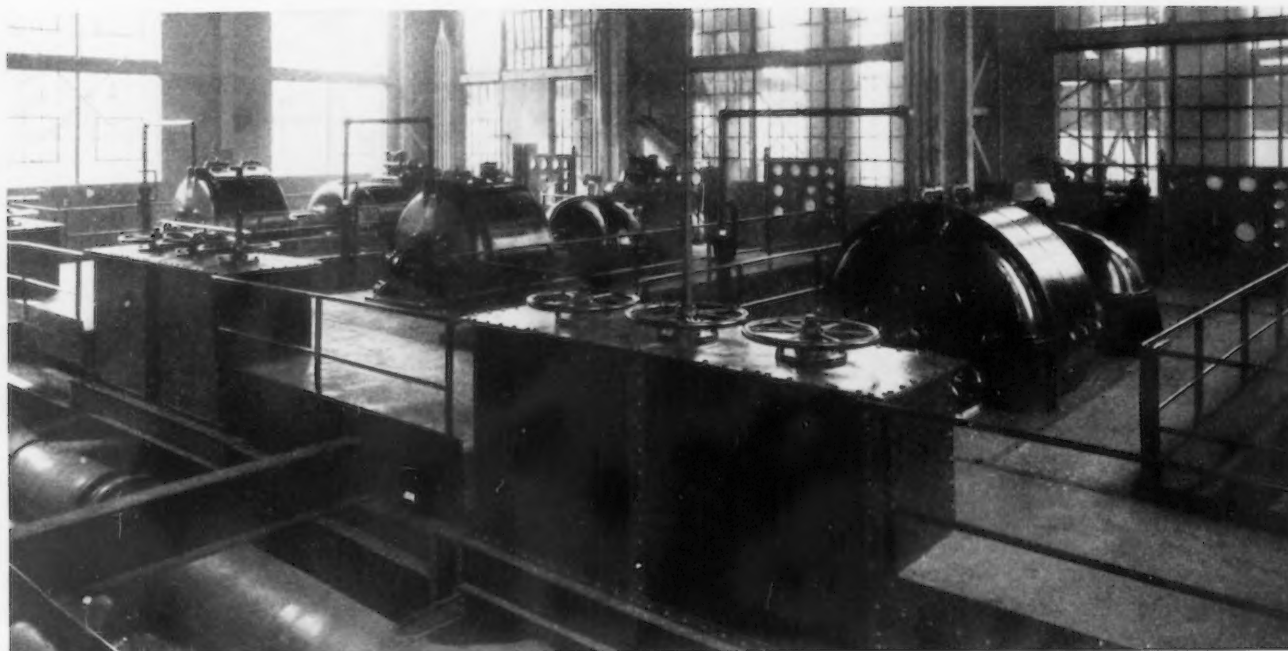
used, a small compressor goes into action automatically whenever the tank pressure falls below 95 lb. Thus, both the failure of the human element and that of the power element are taken care of by safety measures.

Tilting of the mixers, which are set on 46-ft. centers, is about their own axes, on a roller train forming the arc of a circle centered on the axis. Electric motors are the actuating agent, operating through gearing and long link arms.

Iron from the blast furnaces is dumped directly into the mixers from a self-operated Treadwell mixer-type ladle car of 80 tons capacity. A "Wall plug" furnishes current to tilt the ladle, and the



POURING iron from an 80-ton ladle into one of the 800-ton mixers. Power for the tilting mechanism is carried in the cable between man and ladle. The mixer operator officiates.



BLOWER plant for the Bessemer department, showing the three units. Two of these suffice to provide wind for the three converters. ▲ ▲ ▲

mixer operator officiates. By this means it is not necessary to lift a ladle by a crane, with the attendant loss of time and the danger of such a procedure. At the same time, heat is conserved, as the mixer-type ladles lose almost no temperature between blast furnace and mixer. Consequently, the mixer metal gets to the converters very hot.

Converters and Their Blowing Equipment

Three turbo-blowers driven by steam are so inter-connected that any one of them may blow any one of the three Bessemer converters. There is sufficient blowing capacity in these units so that two of them can handle the requirements of all three converters, leaving the other as a standby. This flexibility element has been carried out throughout the plant.

In replacing the three old converters, now discarded, the new ones were placed outdoors, blowing against the sky rather than throwing their spittings against a wall or shield and endangering men as chunks gradually peel off and fall. This is believed to permit reclaiming as much of the metal spit out of the converters as in a housed-in plant. And it was felt that the safety feature was most important.

All three converters are handled from an inclosed pulpit opposite them and at a little distance away, from which a clear view is had of all three. There is a volume measurement on the blast air, as well as a pressure gage, to control the character of the blow at all stages. Each vessel has its gearing and other movable equipment within a dog-house reaching over the active trunnion, and thoroughly protected from the weather. Here everything is readily accessible for adjustment or repair. The converters, which are on 46-ft. centers, are tilted by means of a worm drive, giving a positive lock. Electrically operated brakes fitted to the motors supplement this locking feature. The foundations were

completed late in December, 1929, and the first metal was blown July 28, 1930.

Motor-driven ladles of mixer metal supplying the converters are operated from a distant-control station in the end of the mixer house next adjoining the converter bay. Each of the two "buggies" (of 35-ton capacity) can be spotted as required. A system of signal lights in the station tells the operator when the ladle car is exactly at the center-line of the converter, and it is only in this position that he can tilt the ladle and dump its contents. Similarly, a scrap-charging car, known in the plant as a "grass-hopper," is operated from a distant-control station and spotted opposite each converter in turn as required.

A one-leg gantry crane spans the converter yard and the vessels themselves. This has enough over-



General view of the open-hearth charging floor, showing the three tilting



▲ ▲ ▲ **P**OURING bay of open-hearth department, showing open-hearth ladles at right and Bessemer ladles in left foreground. The ingot molds are fluted and show a heavy wash.

hang north of the converters so that it can pick up loads from the outside yard, also. A portable repair house, for men doing maintenance work on the plates and tuyeres, is inclosed to protect them from sparks or heat from the blow of the next vessel. This is placed where needed, being moved by its own motor drive.

Fresh bottoms are raised to the vessels by means of a Hele-Shaw pump on the jack car. The height of this lift is greater than customarily encountered, because of the size of the ladles (50-ton) into which the converters pour, and the consequent necessary vertical clearance of the vessels when pouring.

One particularly interesting piece of equipment is a continuous-type bottom-drying oven, in the bottom house serving the converters. This oven is 151 ft. long and 15 ft. 2 in. wide inside, and has capacity

for 11 bottoms at once. They are shoved in at one end by a pusher, one bottom being ejected at the east end every time one is entered at the west end.

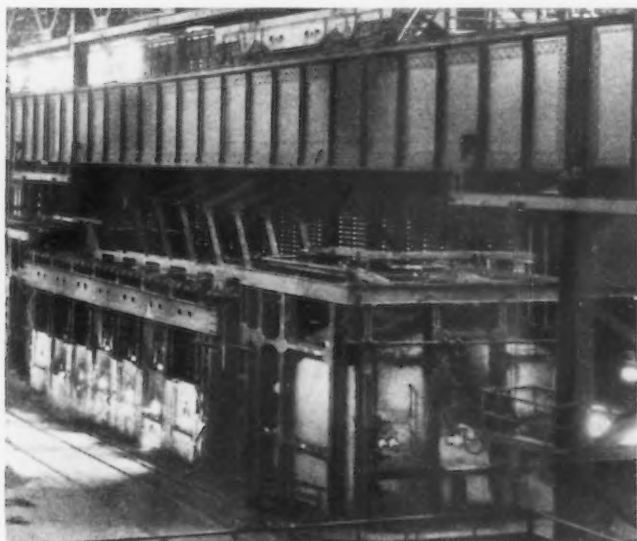
Each bottom goes in on a car and, as a dried bottom is removed from the ejected car on the east end, that car is picked up by the 50-ton crane, carried back to the west end and placed on the rails between pusher and furnace door, ready to receive the next green bottom. The cycle takes about 54 hr., and the firing zone is run at about 800 deg. F.

A sand seal along the two edges of the cars passing through keeps the heat of the oven from getting at the running gear of the cars, and thereby saves the trouble which would be incident to burning out the lubricant, etc. This oven is heated by seven sets of burners, using coke oven gas, coming in at the top and leaving through tuyeres at the bottom. There are three burners in each set and these are staggered, three sets on one side of the furnace and four on the other, all in the central portion.

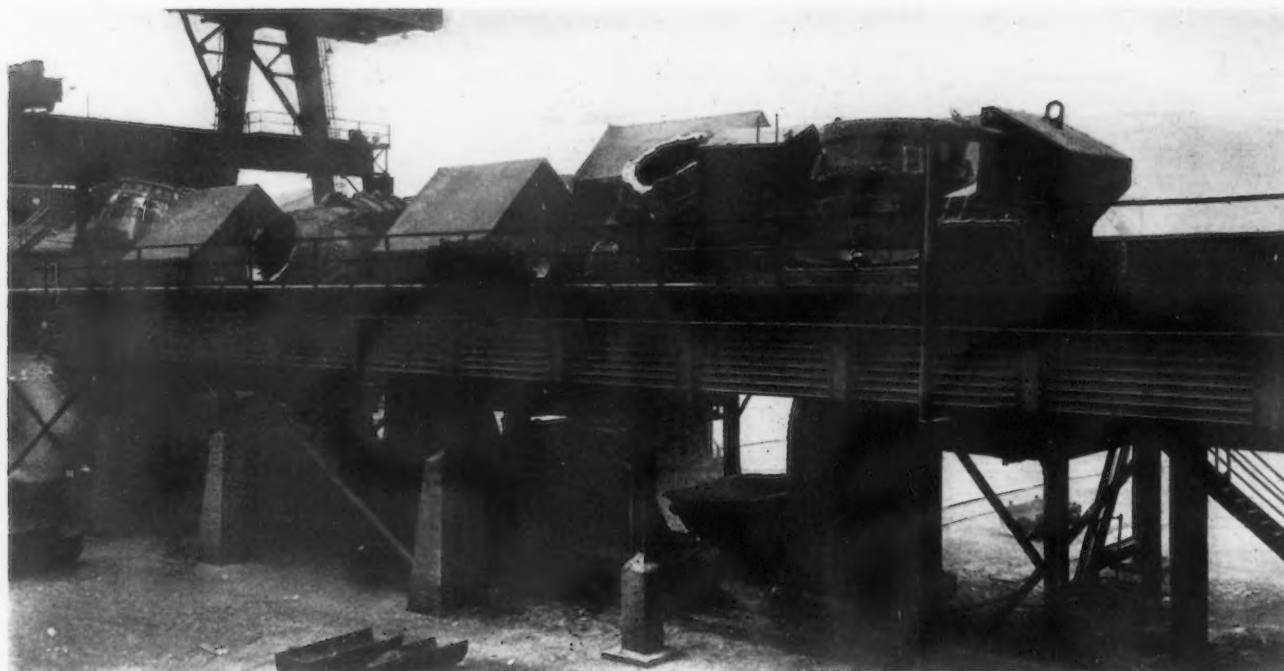
Thus, the two ends of the furnace are free from the highest temperature, their insulated doors are made much more readily movable through lack of warpage, and much heat is conserved in the process. Bottoms are brought gradually up to temperature as they approach the firing zone from the charging end, and then are gradually cooled on leaving the firing zone and approaching the exit. This furnace is of National Tube Co. design, and was built by the Rust Engineering Co., Pittsburgh.

Undercharging the Open-Hearth Furnaces

Present practice in the open-hearth department involves running the furnaces with a charge giving a heat of 150 tons, although the units themselves were designed for 250 tons capacity. There are seven full-sized doors on each furnace, but the two end doors are not used for charging. They were in-



furnaces. Each furnace has seven doors, but only five are used for charging.



GENERAL view of the three converters, with one of the ladles for filling them. This view, taken from the control pulpit, shows dimly underneath the converters one of the fireless locomotives and a ladle for receiving blown metal.

stalled to make it easy to keep the port slopes in good condition, during or between heats.

These furnaces are tilted in exactly the same manner as the mixers, and by equipment which is practically a duplicate of the mixer tilting mechanism. The total moving weights involved are considerably greater in the case of the full mixer than for the open-hearth furnace.

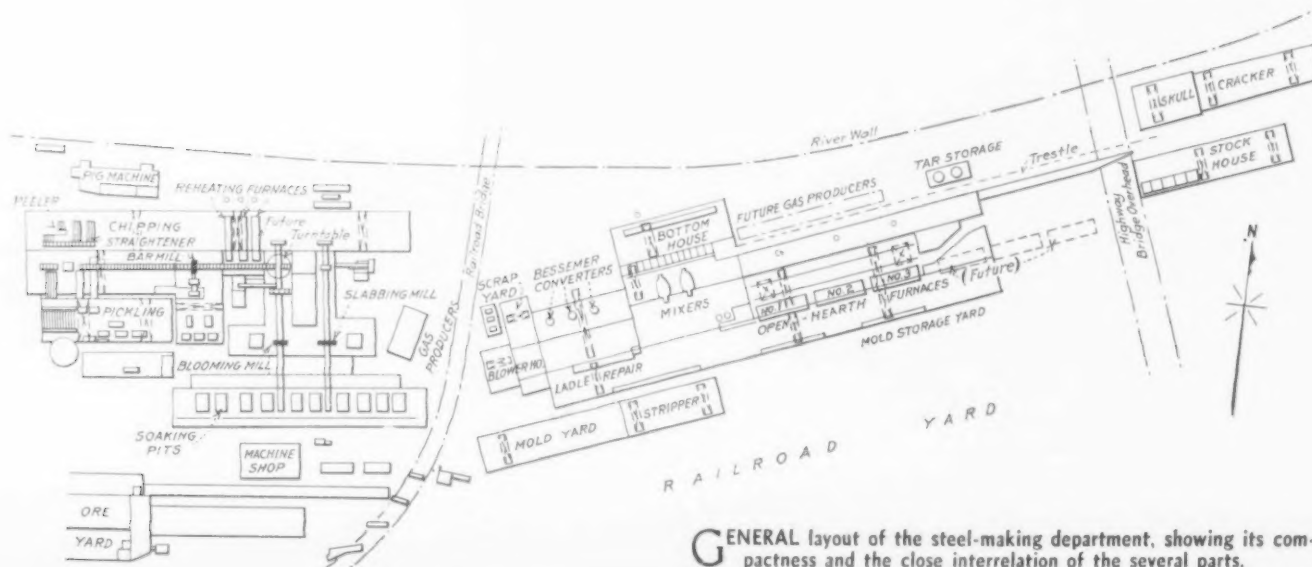
The furnaces are set 115 ft. center to center, allowing ample space between the units. The bath is about 24 in. deep as the furnaces are at present run, and measures about 40 ft. in length by 13 ft. in width on the slag line. The furnace structure has about 16 ft. width between the brick front and back walls and 56 ft. length from block to block.

All regenerative chambers are insulated and in-

cased with $\frac{1}{4}$ -in. steel plate, to prevent detrimental infiltration of air and thus to promote better control of furnace atmosphere and operation. Insulation includes $4\frac{1}{2}$ in. of Sil-o-Cel. The furnace bottoms are insulated, also.

An unusual height, given to the open-hearth building, accentuates the impression of spaciousness. The top of the monitor in the roof is 125 ft. above the yard level. The bottom chord of the roof truss is 79 ft. 6 in. above the yard, and the charging floor is 22 ft. 6 in. above the pit. The crane rails are 38 ft. off the floor.

Gases from each furnace pass through a Connolly waste-heat boiler on the way to the 200-ft. stacks. The gas temperature is reduced by transfer through the boilers from 1100 to 1200 deg. F. to 450



GENERAL layout of the steel-making department, showing its compactness and the close interrelation of the several parts.

or 500 deg. Enough high-pressure steam is here generated to run the turbo-blowers for the Bessemer department. Blaw-Knox reversing valves are used on the open-hearth furnaces.

Two large tanks, 210,000 gal. capacity each, store a supply of tar or oil for open-hearth use. These are served by a battery of pumps, both for filling the tanks and for feeding the furnaces. Two 10,000-gal. tanks connected with heating coils, through which the fuel passes from the large tanks on its way to the furnaces, bring the total storage capacity to 440,000 gal.

Each of the two ladle cranes is of 200 tons capacity, with 40-ton and 15-ton auxiliary hoists. The

plugs, at time intervals of two or three times a day. Their "saddle" tanks store enough hot water to maintain an adequate steam pressure for operating for several hours between "refills."

New ingot mold cars, made by the Lorain Steel Foundry Co., Johnstown, Pa., are in use. Each is 13 ft. long over all, and runs on the 3-ft. gage track serving to connect the pouring platform with the soaking pits. Hyatt roller bearings on the axles make for ease in hauling. Each car carries two or three or four molds, according to size of ingots to be made. When there are four molds, they rest on two double stools.

Three sizes of ingots are made here, all in fluted

▲ ▲ ▲
BOTTOMHOUSE
for Bessemer department, showing at left the continuous-type bottom-drying furnace and at right the pans for mixing ganister and other materials used in making bottoms.
▼ ▼ ▼



bails are somewhat closer together than would fit a 150-ton ladle circular in cross-section. This was done deliberately, and the ladles made elliptical in section, so that the same bails and pouring equipment could be utilized in handling the Bessemer ladles of 50 tons—the combined product of two converters. These ladles, in turn, are elliptical in the other direction. Thus, there is no Bessemer pouring platform as such, all Bessemer heats being poured in the open-hearth pit.

Two Alliance 12-ton charging machines of the floor type in the charging bay handle scrap, limestone, ore and other cold products going into the furnaces. Two overhead cranes here are of 100 tons capacity, each having two auxiliaries of 40 tons and 25 tons respectively.

Two H. K. Porter fireless locomotives are employed, one to handle drags of charging-box cars on the open-hearth floor, while the other hauls the Bessemer ladles. They take steam from convenient

molds, which are said to give excellent results in rolling. The sizes are 18 x 18 in., 25 x 25 in. and 19 x 34 in., corresponding respectively with ingot weights of about 5400 lb., 10,500 lb. and 11,000 lb.

Rolling the Steel into Rounds

Steel from the ingot stripper goes directly by a short run to the soaking pits, where it is prepared for rolling. There are ten soaking pits furnaces, six of three holes (two of them new) and four of four holes. All old furnaces have been rebuilt.

These pits are closely associated with two mills, one blooming, the other slabbing, toward which the heated ingots move in a line at right angles to the axis of the row of soaking pits. Both these mills are of 40-in. size, the slabbing mill having been changed over from a universal slabber to a straight two-high proposition, in the interest of getting a wider slab to feed the plate mill.

Both mills have been equipped with new shears,

furnished by Mackintosh-Hemphill & Co., Pittsburgh. One shear of 600-ton capacity serves the slabbing mill, while one of 1000 tons takes care of the blooming mill. Heavy cropping of the blooms for the seamless tube works is practiced, inasmuch as the material passing through such a process is subjected to a great deal of punishment and must be perfectly sound.

Leaving the blooming mill shears, the blooms, cut to length, pass over a 40-ft. turntable section of the runout table, on which they are turned 90 deg. and sent along the approach table to the bar mill.



▲ ▲ ▲
FIRELESS locomotive, 3-ft. gage, pushing a drag of charging box cars from stockhouse into open-hearth building. These engines can operate for a number of hours between refills from a steam line.
 ▼ ▼ ▼

This is a 32-in. two-high reversing mill, furnished by the Mesta Machine Co., West Homestead, Pa., and driven by a 3000-hp. Westinghouse motor. Here the steel is rolled into rounds varying from 3 to 11 in. in diameter.

The mill has brass bearings lubricated for both thrust and rotation. Lubricant from the greasing system is forced up underneath the roll necks.

Between the turntable and the bar mill are two reheating furnaces, with provision allowed for a third in future. These were designed and built by the Surface Combustion Co. Customarily, however, the steel from the blooming mill runs right through to the bar mill on its original heat.

Passing beyond the bar mill, the rounds reach a hot saw, 60 in. in diameter, which cuts them to the length required to make the length of seamless tube for which they were rolled. The saw has a peripheral speed of 20,000 ft. a minute. The cut lengths are automatically tilted out of the cutting cradle to the center punch, which places a punch mark in one end for use at the beginning of the piercing operation. Thence they pass to the cooling bed on the way to the chipping station. To accommodate, clear of the mill manipulator, the lengths involved in making 3-in. rounds, the saw has been placed 192 ft. beyond the center line of mill.

Great care is taken in the chipping department to get out all seams or scabs. These would be fatal to best results in the tubes and must be eliminated at this stage. Some of the rounds going through are put through a billet peeler, which takes off a layer about $\frac{3}{32}$ in. thick and thereby reduces the diameter by $\frac{3}{16}$ in.

Rotating cutters on the billet peeler have six

cutter blades of high-speed steel. One grip on the machine pushes the bar half-way through, when a second grip, seizing the peeled portion, pulls it the rest of the way. The result is a spiral cut. By this means practically all surface defects are eliminated without necessity for the hand-operated air-chipping process.

Pickling equipment is nearing completion for handling the rounds preliminary to passing them through the seamless tube process. This will add to the facility of discovering and eliminating surface flaws, and make just so much more positive the

control of quality in the steel. And flexibility is served, in that chipping can be done on the bloom, or on the round, and before or after pickling.

▲ ▲ ▲ A Nickel-Barium Alloy for Spark Gaps

THE development of an alloy which will emit electrons is announced in a paper before the fifty-ninth general meeting of the Electrochemical Society, held at Birmingham, late in April. The authors are O. S. Duffendack and R. A. Wolfe, University of Michigan, and D. W. Randolph, AC Spark Plug Co., Flint, Mich.

It was discovered that irregularities in the sparking voltage of spark gaps were due to non-uniformities in the composition of the electrode materials. Small inclusions of magnesium in the nickel alloy, ordinarily employed for spark plug electrodes, were found to be distributed at random through the wire and to affect the sparking voltages. A thorough investigation by the authors established a complete coordination between the sparking voltage of a gap and the work function of electron extraction from the cathode surface. The sparking voltage of a standardized gap increases when the thermionic electron emission of the electrode wire, measured under standardized conditions, decreases.

After many experiments, a nickel alloy containing barium has been developed that is homogeneous in composition and readily reproducible. Spark gaps having electrodes made of this alloy have substantially constant sparking voltages. The alloy has marked electron-emitting properties that make it valuable for use in various electrical devices, and its uses in several ways are being developed, say the authors.

FASTER MILLING WITH TUNGSTEN AND TANTALUM-CARBIDE CUTTERS



USE of tungsten carbide for milling has not kept abreast of its application to other metal-cutting operations, largely because early experiments failed to show comparable results. Attempts were made to follow cutter designs used for other metals, and to use such cutters in machines that were far from being suited for tungsten-carbide operation. Existence of either one of these two conditions will prove unsatisfactory, according to Frank W. Curtis, research engineer, Kearney & Trecker Corp., Milwaukee, in an address before the spring production meeting of the Society of Automotive Engineers, held at Milwaukee, May 7 and 8.

There is no question but what milling is one of the most outstanding applications for tungsten carbide. Success, however, is dependent entirely upon rigidity. Three factors that contribute in this respect are: the cutter, the machine and the fixture. Weaknesses in any one will offset the effectiveness of the other two.

Tungsten carbide is successful for milling because the total amount of metal to be removed is divided among several cutting teeth, and each tooth is not taxed to any great extent. If the face of a piece of work required the removal of 1 cu. in. of metal, and a milling cutter having 12 teeth could do 3000 pieces between grinds, then each tooth would only remove about 250 cu. in. Compared with a single tool, such as used for turning, this amount is very slight, yet the average life of the cutter might represent several days' work.

Inserted Blade Cutters Designed for Tungsten Carbide

Milling cutters of the inserted-blade type, solid and rigid in construction, can be designed without much difficulty so that the full benefits of tungsten carbide can be obtained. Several cutters representative of this design have been used to remove from 1/16 to 3/16 in. from cast-iron parts at feeds in excess of

MILLING is becoming an important application of tungsten carbide, according to Frank W. Curtis, who spoke at a recent meeting of the Society of Automotive Engineers in Milwaukee. Milling cutters have been redesigned, and milling machines improved, to develop the possibilities of the new hard alloy tools. Though more power is required, higher speeds and faster feeds make the new material economical. Often, machining allowances on castings may be reduced, closer tolerances and better finishes obtained. Tantalum carbide, a more recent development, has been successfully applied to milling cutters for machining steel.

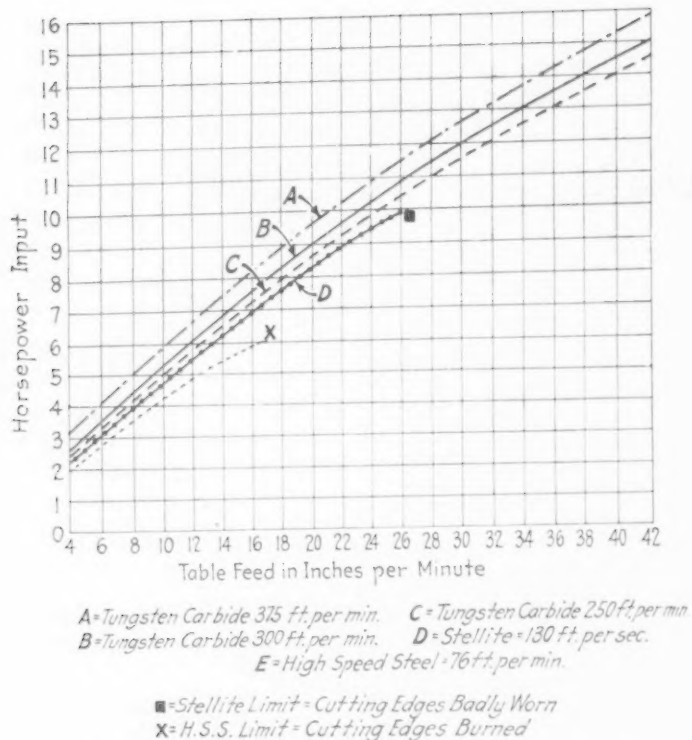


50 in. per min.; bronze, up to 75 in. per min.; and aluminum, up to 100 in. per min. Solid-type cutters, such as small plain and side cutters, and end mills, have been used with unusual success, although their application is somewhat limited. In many cases it is possible to construct a cutter with solid blades that are welded in place to the body. For this design the small steel blade is milled out to receive the tip which is brazed to it. Then, the body is slotted to receive the blades, which in turn are pressed into place. The blades are then tack-welded to the body, then the cutter is finish-ground.

Introduction of tungsten carbide has demanded tool design differing from that formerly used. Milling cutters are no exception. The body should be as solid as possible, and the blades should be of heavy proportions to withstand faster feed rates. In addition to strength, there is a decided advantage in having hardened bodies, in order to resist wear. A milling cutter should be designed so that the tungsten-carbide blades are supported as close to the cutting edges as possible. Overhang causes a slight vibratory action, which seriously affects the life of tungsten carbide. No attempt should be made to equip old cutter bodies with tungsten-carbide blades, because their performance will be disappointing.

Every effort must be made to overcome the possible chance of blades loosening during cutting. Positive locking is very desirable and must at no time be overlooked. Individual clamps or wedges are to be preferred for each blade, because these designs have proved their worth. It is also desirable to back up the blades so that they cannot push away from the cut. This feature is obtained in several ways, such as a backing-up plate that forms a support for the back end of the blades or pins in the body and slots cut in the blade which offer the same feature.

Use of machine tools of a suitable nature is one of the first requirements for the successful application



COMPARISON of horsepower requirements for tungsten carbide, Stellite and high-speed 5-in. diameter cutters milling cast iron. The depth of cut was 0.125 in., width, 4 1/4 in.

of tungsten carbide. There is such a contrast between the speeds and feeds for tungsten carbide, as compared with other tools, it is obvious that milling machines of the older types are not adequate for dependable results.

It is so essential that a milling machine for tungsten-carbide operation be rigid and strong, and be provided with suitable speeds and feeds, that no attempt should be made at any time to apply cutters tipped with this metal in machines that lack the necessary requirements for success. Angular freedom in the gears, excessive backlash, worn lead-screws, and other defects are detrimental to tungsten carbide.

If an existing machine is found to be in perfect condition, and if its size and style appear to be suited to tungsten carbide, then there is no serious objection in attempting the use of tungsten carbide in it. If upon trial, the machine has a tendency to develop chatter that cannot be removed, it would be best to abandon further attempts. Some older machines will work satisfactorily on slower speeds, but will not give satisfactory performance when the spindle and table are to be operated at speeds and feeds suited for tungsten carbide.

Cutters Require More Power

The question is often brought up as to whether or not more power is required for the use of tungsten-carbide milling cutters. The answer to this is decidedly "yes." When the speed of a spindle is increased, the power naturally increases with it; this is true regardless of the type of cutting material used. Stellite, which operates at faster speeds than high-speed steel, consumes more power than

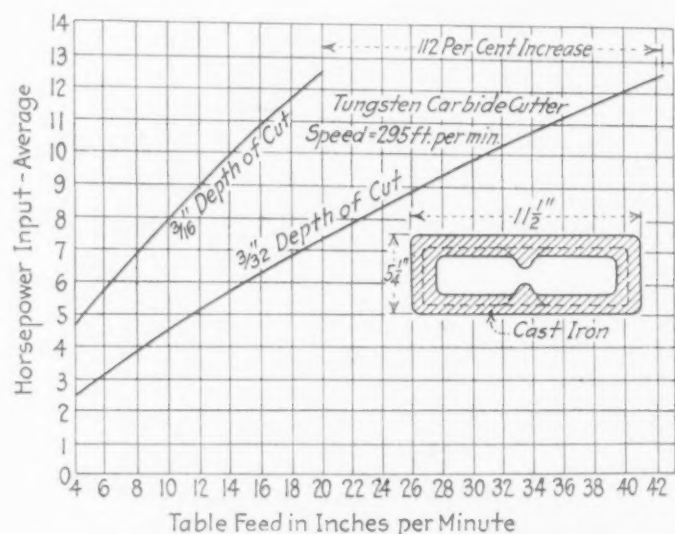
high-speed steel; and tungsten carbide, of course, would use more power than Stellite, although the increase is slight.

The existing differences in power consumption are shown by the accompanying chart of horsepower requirements. All the cuts were taken with 5-in. inserted-blade face milling cutters. The material machined was cast iron; the depth of cut was 0.125 in., and the width, 4 1/4 in. High-speed steel was operated at a speed of 76 ft. per min., and the feeds were varied from 4 to 17 in. per min. At the highest feed the cutting edges of the teeth burned and wore away badly, which indicated that a feed of 17 in. per min. was excessive for this type of material. The next line on the chart shows the results with a Stellite cutter which operated at 130 ft. per min. In this case, feeds from 4 to 26 in. were obtained. At the highest feed, the edges of the blades wore away badly, which indicated that the cut was somewhat excessive. The condition is natural, because the feed per tooth per revolution was almost 0.022 in., somewhat more than is recommended for this type of cutting material.

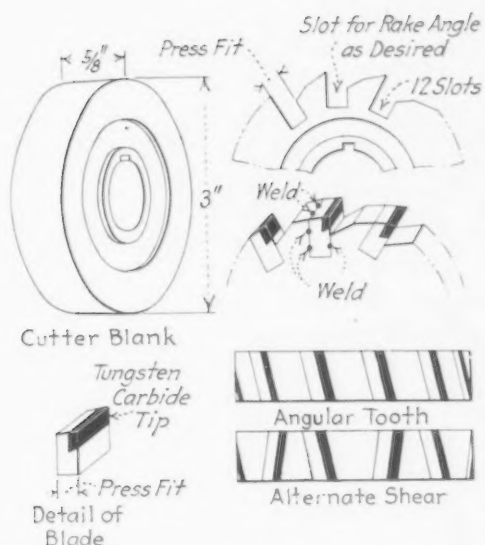
The next line shows the results of a tungsten-carbide cutter operated at 250 ft. per min. The power consumption was slightly higher than that required for Stellite, although the feed per minute was increased beyond 45 in. per min. without any harm to the cutter. The next two lines show the results of the same cutter being operated at 300 and 375 ft. per min. At both speeds the cutters were able to operate at feeds beyond 45 in., as in the previous case. At a speed of 300 ft. per min., with a feed of 42.5 in. per min., the feed per tooth per revolution is approximately 0.017 in. This compares with the maximum feed of Stellite equal to 26 in. per min., or 0.022 in. per tooth per revolution; and of high-speed steel at 17 in., or 0.024 in. per tooth per revolution.

Machining Allowances Affected by Tungsten Carbide

Tests have shown tungsten carbide will machine the scale of the average casting almost as easily as it will the inner surface. Because of this, it is quite



TESTS show that by reducing depth of cut from 3/16 to 3/32 in., the feed can be more than doubled using the same power input, namely 12 1/2 hp.



MILLING cutter design in which the tungsten-carbide tips are brazed to blades that are welded to the body of the tool.

obvious that machining allowances will change considerably in order to suit the characteristics of tungsten carbide. In the past, where an allowance of $\frac{1}{8}$ to $\frac{1}{4}$ in. has been provided for machining, this depth will be reduced to $\frac{1}{16}$ to $\frac{1}{8}$ in.

Pattern changes will have to be made if the full benefits of tungsten carbide are to be obtained. There are three outstanding advantages in making this sort of a change. The first is the saving in material; second, a reduction in horsepower required per square inch of surface being machined; third, an increase in feed without danger of overloading the machine.

The second chart herewith shows these conditions as they actually exist in the machining of a cast-iron surface $5\frac{1}{4} \times 11\frac{1}{2}$ in. in area, with a cored section at the center. With former tools the depth of cut was approximately $\frac{3}{16}$ in. Operating a tungsten-carbide cutter at 295 ft. per min., removing this amount of metal, shows that a feed of 20 in. per min. requires approximately $12\frac{1}{2}$ hp. By reducing the depth of cut to $\frac{3}{32}$ in.—which is ample for tungsten carbide—the horsepower consumption indicates that a feed of 42.5 in. per min. can be obtained, using the same horsepower, namely $12\frac{1}{2}$.

The amount of metal removed per piece at a depth of $\frac{3}{16}$ in. is equal to 7.8 cu. in., or 2.02 lb. The amount of metal to be removed, when this cut is reduced to a depth of $\frac{3}{32}$ in., is exactly half, or 3.9 cu. in., which is equal to 1.01 lb. In other words, the saving in metal per piece for this surface, made possible by reducing the depth of cut, would be equivalent to 1 lb. In this case the cost of the casting is $6\frac{1}{2}$ ¢ a lb. which, of course, is equal to the saving in cost per piece. The outstanding advantage shown, however, is the fact that the feed can be increased 112 per cent without increasing the horsepower originally required.

Closer Tolerances and Better Finishes Obtained

Cutting pressures are usually reduced with the result that closer tolerances can be maintained. Tungsten-carbide milling cutters operating at higher speeds

frequently enable better finishes to be obtained. This is due to the slight reduction in feed per tooth per revolution in spite of the faster rate of feed which is made possible.

Many tests, as well as analyses of actual operations, have shown that less distortion takes place with tungsten-carbide milling than with cutting metals that must operate slower. Thin, frail castings and parts that usually require limited feeds can be milled faster with tungsten carbide in proportion to the increase in speed.

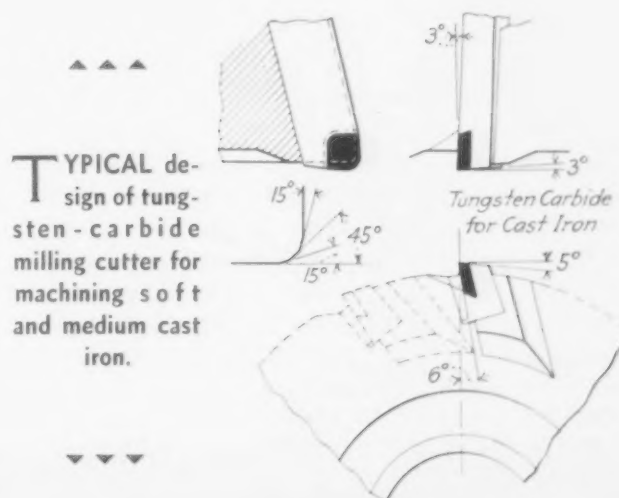
The higher speeds of tungsten-carbide milling cutters greatly lessen the danger of chipping, or breaking away the edges and corners of castings. This chipping condition often necessitates the reduction of feed when slow peripheral speeds are used, but here again the use of tungsten-carbide cutters very often eliminates this trouble. Among other economies offered by tungsten-carbide milling, are the possibilities of combining roughing and finishing operations in one cut. The free-cutting action and ease with which a tungsten-carbide cutter operates makes this possible. Annealing operations have been eliminated by the use of tungsten carbide, because of its cutting ability.

Changes in Fixture Design Required

Milling fixture design appears to stand out quite prominently among the important changes to accompany the use of tungsten carbide. Improved methods of clamping are obviously needed. The traditional methods of applying straps, bolts, nuts, and screws to fixtures are doomed. Quick-operating, fool-proof clamping devices are highly essential in tungsten-carbide cutting operations. This means that in many cases the loading time of an operation will have to be lessened in proportion to the reduction in machining time in order that the full benefits of tungsten carbide may be attained. To accomplish this means that entirely new fixture designs will have to be provided.

Cutting Angles for Milling

Experience has shown that the rake and clearance angles for tungsten-carbide turning tools should be reduced slightly from those conventionally used for high-speed steel. This same practice is carried out for milling cutters. The angle on the periphery, or



outside diameter, should be sufficient to clear the work so that the heel of the blade will not drag. Usually 5 deg. will suffice. These angles can be altered slightly one way or the other without any serious variations in cutting efficiency, life between grinds, or horsepower consumption. For example, the rake angle could be reduced to 1 deg. and the face angle increased to 8 deg. without any material change.

Tantalum Carbide Satisfactory in Milling Steel

Since the introduction of tungsten carbide many improvements have been made in the manufacture of this metal, so that it has become harder and tougher. The machining of steel, however, has not been entirely successful, due to the cratering action which exists when steel chips pass over the face of a tungsten carbide tip. This can be explained as being due to the strong affinity that tungsten has for steel.

Most of this difficulty has been eliminated by the recent introduction of tantalum carbide, a product which is similar in characteristics to tungsten carbide. Tantalum carbide does not have an affinity for steel, therefore the cratering action does not take place. In so far as tantalum has no affinity for steel, the problem of brazing becomes more difficult. With tungsten

carbide, the bond between the tip and steel shank is greatly strengthened due to the affinity of the two metals. The reverse condition is true with tantalum carbide and the steel body. However, the brazing problems have been rather well overcome and tantalum carbide promises to be highly successful for the machining of steel.

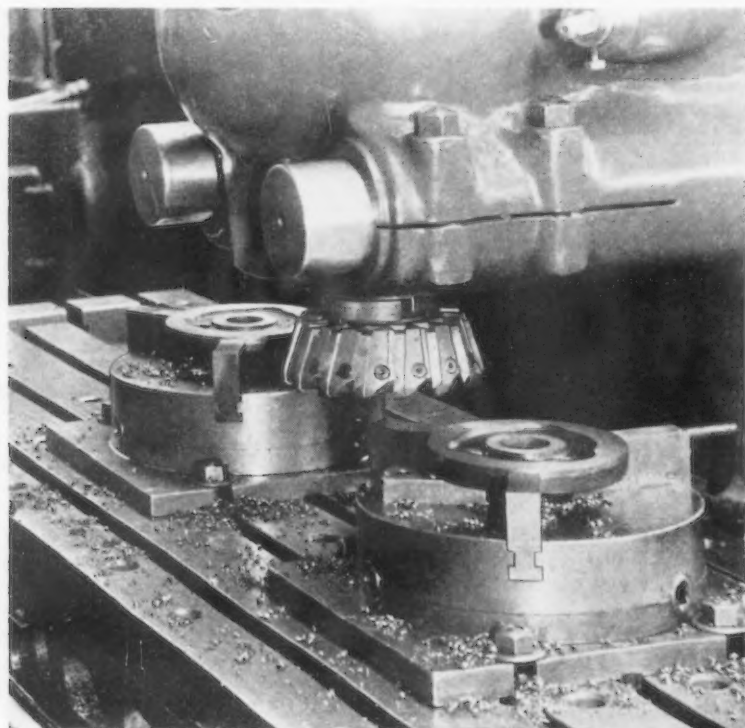
In connection with the milling of steel, tantalum carbide has proved satisfactory. From tests to date, it appears that the increase in speed and feed over high-speed steel will be approximately 100 per cent. In other words, if a high-speed steel cutter is operating at 70 ft. per min. with a feed of 6 in., it is quite possible to assume that tantalum carbide will run somewhere between 140 and 160 ft. per min. at a feed of 12 in. per min.

Some Tungsten-Carbide Milling Applications

A SET-UP for the milling of cast-iron pump bodies required a 3-in. tungsten-carbide cutter. The speed of the cutter was 280 ft. per min., and the feed was 32.5 in. per min. The depth of cut was 1/16 to 3/32 in., and the cutting time for six pieces was 42 sec. As formerly handled, this operation was completed at a feed of 12.5 in. per min. The increase, using tungsten-carbide cutters was equal to 260 per cent.

A set-up for the milling of cast iron chain covers called for a tungsten-carbide cutter which was operated at a speed of 288 ft. per min. The table feed was 26 in. per min., and the depth of cut was 1/8 in. The actual cutting time per piece was equal to 20 sec. With high-speed steel, the table feed was 10 in. per min. The increased feed obtained with tungsten carbide is equal to 160 per cent. The depth of cut for this operation can be reduced without much difficulty so that only 1/16 to 3/32 in. of metal would have to be removed. On this basis, the feed could be increased without difficulty to 40 in. per min.

A 9-in. tungsten-carbide cutter, set up for the milling of cast iron flywheel hous-

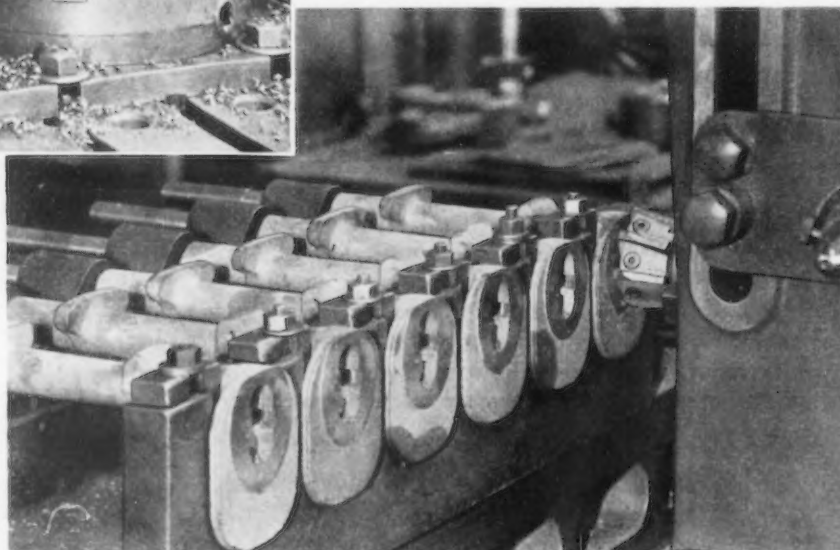


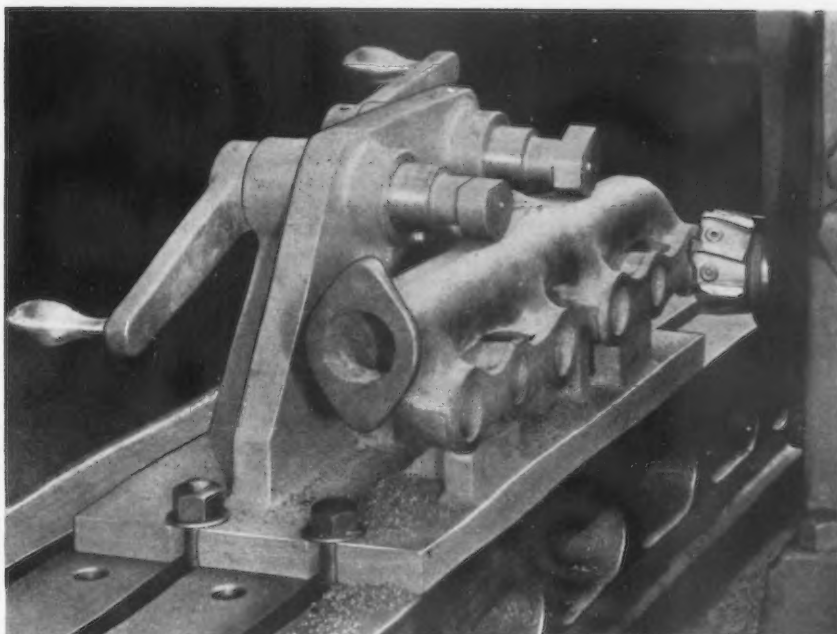
THIS tantalum-carbide cutter on SAE 3140 steel gear blanks operates at a speed of 170 ft. per min., with feed at 14 in. per min. (above).

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THESE cast iron pump bodies are milled with a 3-in. tungsten-carbide cutter at a speed of 280 ft. per min., a feed of 32.5 in. per min.

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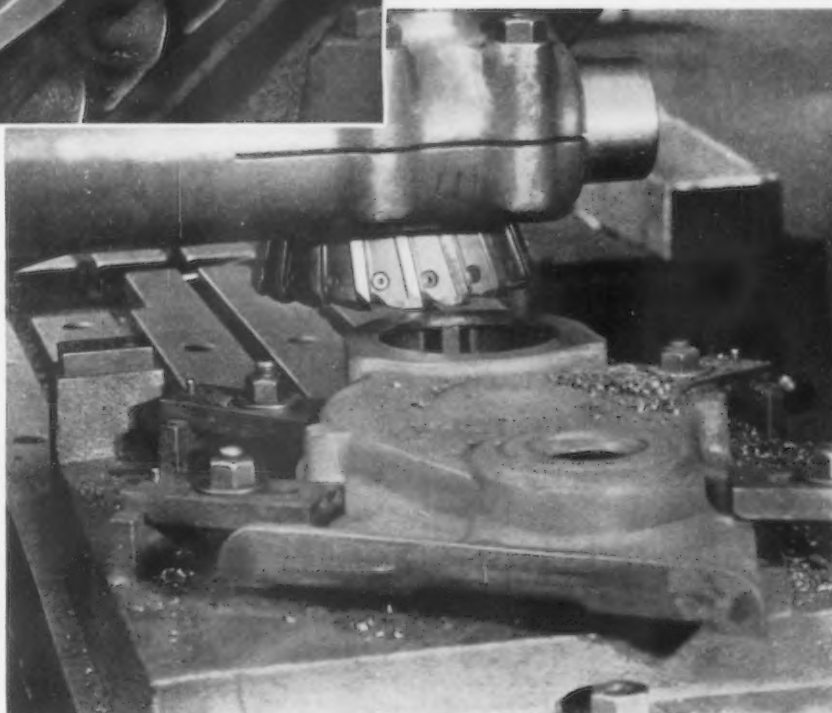




SMALL manifolds, formerly disk ground in 45 sec., are now milled in less than 30 sec. (at left).

♦ ♦ ♦

THE tungsten-carbide cutters used for this cast iron chain cover operated at 288 ft. per min.



ings, is shown in an accompanying illustration. The face being machined was approximately 8 in. high and 8 in. wide, with a cored hole at the center. The depth of cut was approximately $\frac{1}{8}$ in. The cutter was operated at a speed of 297 ft. per min. A table feed of 26 in. per min. was used. The cutting time per piece was 20 sec. The fixture used was of the indexing type so that the operator was able to load a housing while a piece was being milled.

Small manifolds were formerly disk ground; the actual grinding time required to obtain the necessary finish was approximately 45 sec. Tungsten-carbide milling is done at a feed of 52 in. per min. and the cutting time is less than 30 sec. The depth of cut in both cases is $\frac{1}{16}$ in. The outstanding comparison of these two methods, however, is the fact that, for grinding, the wheel cost per piece is more than 500 per cent greater than the actual milling cutter cost, as a result of the long life obtained with a tungsten-carbide cutter.

In addition to what has already been said regarding the use and application of tungsten and tantalum carbides, there are other factors which are necessary to consider in order to obtain successful results. Some of the most important are:

- 1.—Carefully analyze every milling operation before applying tungsten-carbide cutters.
- 2.—Endeavor to make each milling application a success. Do not attempt to run the cutter too fast.
- 3.—Give operators full instructions before allowing them to use the tungsten-carbide cutters.
- 4.—If the operation is a new set-up, start slowly

and carefully; do not try to obtain maximum results on the first cut.

5.—Do not disengage the spindle while the feed is engaged.

6.—Do not try to set up an endurance record with tungsten-carbide cutters. They should give longer life, but there is a limit.

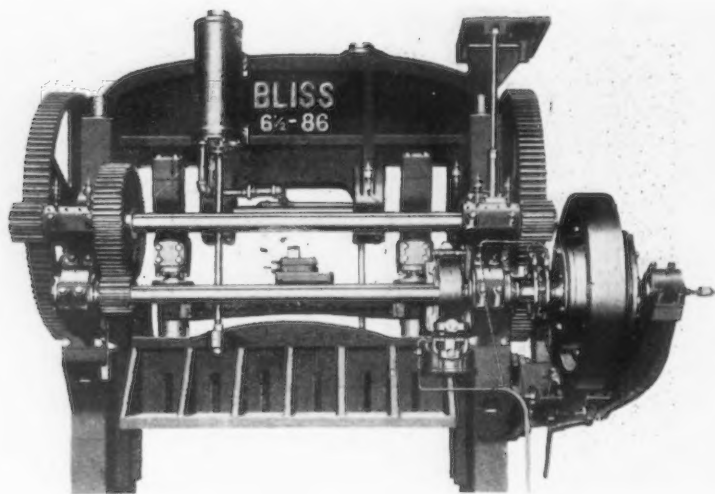
7.—Be sure to use a grinding machine that is in good condition.

8.—After a cutter has been reground, be sure to inspect it before placing it into service.

9.—Tungsten-carbide cutters are expensive. Handle them as carefully as you would a micrometer or other precision instrument.

10.—Do not use a milling cutter for machining all kinds of materials.

11.—When increasing the speed and feed of a machine, there is a likelihood of overloading the motor. To be on the safe side, check the power input with an ammeter or wattmeter, or a proper recording instrument, to make sure that you are on the safe side.



Magnetic Clutch Applied to Bliss Press

APPPLICATION of a Stearns multiple-disk friction clutch with magnetic clutch and brake control has been made to power presses built by the E. W. Bliss Co., Fifty-third Street and Second Avenue, Brooklyn, N. Y. The friction disks and plates are the same as on the standard mechanically operated clutch, but all operating links and levers are eliminated; the pull of the magnet is transmitted directly to the moving plate of the clutch. No thrust is transmitted to any bearing. The magnetic brake is of the type used with manipulator and crane motors and is especially wound to suit press operating conditions. Direct current is required for operation.

Full automatic features are provided by the control equipment, and all operators are safeguarded. On one side of the press is mounted an operating cabinet containing a four-station transfer switch. Two start buttons and one emergency stop are provided for each operator. These controls have special covers so that they can be operated by workers wearing heavy gloves. The start buttons are of the lock-in type which enables any of them to be closed when the full number of operators are not employed. A foot switch can be provided for use with all hand buttons locked in.

The four stations on the transfer switch give the following working conditions: First, with both hands of all operators on start buttons, the clutch will engage and although hands are then removed, the press will complete one cycle and stop automatically with slide at top stroke. Second, after the press is started it will run continuously until stopped by depressing any one of the stop buttons, enabling the operators to catch every stroke of the press. Third, a separate button is provided for inching. The press runs as long as the button is depressed and stops immediately when it is released. This station is used for die setting. The fourth condition

is similar to the first except that all buttons must be held until the slide reaches bottom stroke. This provides additional safety on slow-running presses where an operator might attempt to adjust the work on the die after the slide had started down. The length of time the operators are compelled to hold the buttons is determined by an adjustable cam.

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New Knife Grinder Has Wide Service Range

THE Covell Hanchett Co., Big Rapids, Mich., is introducing a new knife grinder featuring a construction which makes for accuracy, durability, wide range of work and convenience of operation. This machine, designated as the G K, is made in a variety of sizes for use in pattern shops, planing and saw mills, wood working plants, car and body and other shops.

Cabinet base, ball-bearing arbor, water attachments and full automatic operation are features. Standard

equipment includes a 12, 14 or 16-in. Hanchett Red Anchor cylinder-type grinding wheel, for which marked economies are claimed. A segmental wheel in an all-steel chuck can be furnished if desired.

The cabinet base, of simplified construction, provides solid, practically full length, support of the heavy knife bar and traveling carriage. The knife bar is installed as a solid unit integral with the carriage, with no slide adjustments or adjustable connections. Thus instead of feeding the knife bar, slides, support and work to the grinding wheel, the grinding wheel is fed to the work. The grinding head is mounted on a broad, heavy slide providing a compact and rigid mounting with fewer wearing parts; these parts are of large size, and take-ups for wear are provided. The grinding wheel spindle is equipped with ball bearings; all other bearings are of bronze and are well lubricated.

Transmission, of the clutch-gear reversing type, is of the same design as employed in larger machines. Gears have cut teeth and are hardened. The transmission is a built-in unit, permitting convenient replacement or repair.

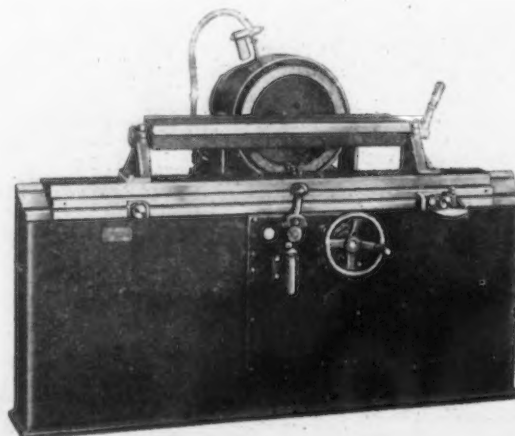
Carriage drive is by rack and hardened pinion from the transmission unit. These parts are designed to provide excess strength and wearing capacity for the operating load and, being inclosed in the cabinet base, are protected from dust and grit. Both automatic and hand-operated cross-feed of the grinding wheel to the work are provided. Automatic feed is adjustable for a 0.0005 to 0.002-in. range; other ranges of feeds may be obtained on special order.

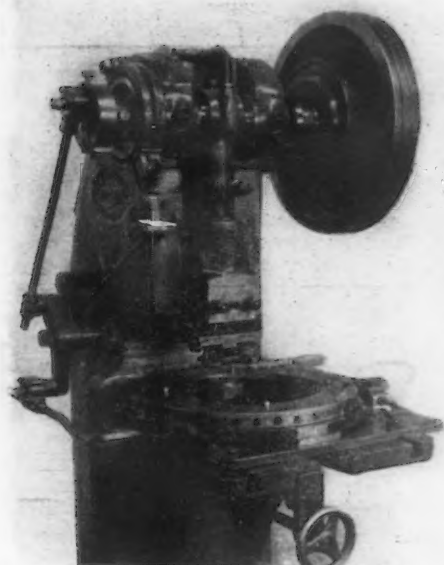
The knife bar with heavy cored sections is designed for rigidity under all grinding requirements. T-slots, or a combination of T-slots and separate clamps, are provided for both thick and thin knives. There is an indicator for grinding at any bevel and adjustments are provided for grinding either toward or away from the knife edge. Coolant is supplied by a built-in centrifugal pump from a large tank in the base of the machine.

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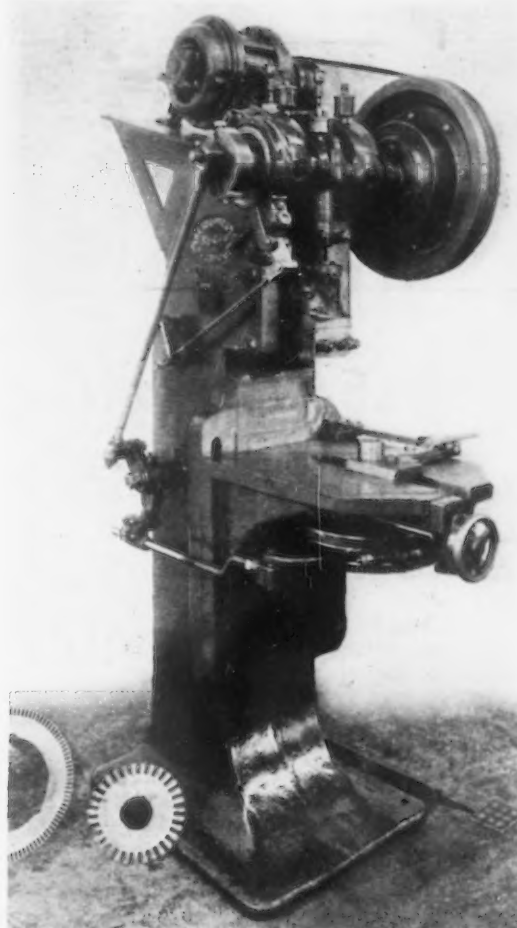
SOLID support of the knife bar is provided by the cabinet base of this knife grinder. Full automatic operation is a feature.

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THE new V. & O. press (left) set up for internal notching of electric motor stator laminations. (Right) For external notching of rotors or similar work, the indexing mechanism is located underneath the table.



High-Speed Press Notches Motor Laminations

DESIGNED primarily for notching electric motor laminations but also suitable for cutting circular saws, bearing separators and similar work, a high-speed notching press, designated as the No. 41N, has been brought out by the V. & O. Press Co., Hudson, N. Y. Tolerances of 0.002 in. or less are said to be maintained when operating at speeds of 450 to 600 strokes a minute.

With the attachments provided, the machine will cut from 12 to 96 notches on outside diameters from 3½ to 18 in.; also from 12 to 132 internal or stator notches on 4 to 15½-in. diameter disks. Other machines may be obtained for notching stator and rotor blanks up to 72 in. in diameter.

Of the pedestal type, the body and legs of the press are integral, resulting in extreme rigidity. Overhanging journal bearings carry the thrust directly into the body proper. The shaft has an eccentric throw, affording rigidity and large bearing surface. All main bearings are alloy bronze bushed.

To eliminate shock from engagement at high speeds, there is an automotive-type multiple-disk friction clutch with a brake arranged to stop the press at the top of the stroke at the instant the clutch is released. Adequate lubrication facilities are provided.

The extra long slide runs in ways

of equal length that are cut in the solid body casting, no check pieces being required. Adjustment is made by a single, loose gib and one set of adjusting screws. These features, common to all V. & O. standard presses, are designed for precision of slide travel and accuracy of punch and die registration.

The indexing mechanism is actuated by a driving crank on the press shaft, through a series of connections and a bellcrank by which a reciprocal motion is delivered to the driving lever. All connections are mounted on ball bearings, resulting in positive, frictionless motion.

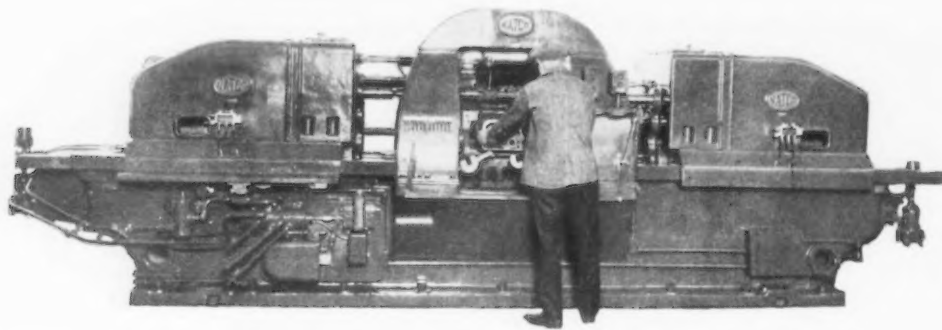
For internal or stator notching, the indexing attachment is provided with a circular base attached to the press bed and carrying a friction ring. The index ring, attached to an upper flange of the friction ring, has notches cut in its periphery to engage the index pawl. To the upper surface of the index ring the work holding plate is secured. Work to be notched is held by dowels, spring clips, or a combination of both. The assembly of friction ring, index ring and work-holding plate rotates freely around the outer circumference of the base.

Motion is applied to the work by means of driving jaws actuated by the reciprocating driving lever. The driving jaws comprise a split ring lined with a woven asbestos, gripping the friction ring. With the forward

stroke of the driving lever, the index plate is rotated slightly past the point of engagement with the index pawl, which automatically engages the notch in the index ring. The return stroke of the driving lever carries the driving jaws back and seats the pawl firmly in the notch. Here the slip action begins, the driving jaws sliding on the friction ring to allow the driving lever to complete its return stroke. While the index ring and work remain motionless the press slide descends and operates the notching dies. An automatic throwout is provided to disengage the clutch when the work has been completely notched.

Means are provided to secure the proper pressure of the driving jaws on the friction ring and to compensate for wear. Index rings and work holders are both quickly interchangeable and graduations at the front of the attachment base and on the driving crank make possible rapid changes from one number or style of notching to another. In-and-out adjustment of the attachment is made by means of a handwheel at the front.

For external or rotor notching, the driving jaws, friction ring, and index ring are placed on the underside of the table and the work holder on the upper side, the work holder being driven by a spindle through the table as shown in the large illustration. For external notching the work is usually keywayed to facilitate driving.



Two-Way Horizontal Driller for Cylinder Block Camshaft Holes

A SPECIAL two-way horizontal hydraulic drilling machine for drilling the camshaft hole in cast-iron automobile cylinder blocks has been built by the National Automatic Tool Co., Richmond, Ind.

This machine, made up of two horizontal sliding heads mounted on a one-piece bed, is fully automatic in operation, including the indexing of the trunnion, the clamping and releasing of the pieces in the fixture. The only work required of the operator is sliding the pieces in and out of the fixture. Hydraulic pressure for moving the heads and indexing the fixture is supplied by a special pump driven by a 10-hp. motor through a silent chain.

The right-hand head has a thrust of approximately 20,000 lb., has a

travel of 21 in. and is equipped with a fixed-center gear-driven cluster box containing four heavy-duty spindles having nose adjustment. Spindles are $3\frac{1}{4}$ in. in diameter, are roller-bearing mounted and are driven by a 15-hp. constant-speed motor. The left-hand head is identical with the right-hand head except that it has a travel of 25 in.

A six-position, trunnion-type, roller-bearing mounted, automatic indexing fixture having an automatic clamping and releasing device arranged to hold one part in each position is furnished with this machine. This fixture is indexed mechanically by movement of the left-hand head.

Production is at the rate of approximately 75 pieces an hour. The machine weighs about 47,000 lb.

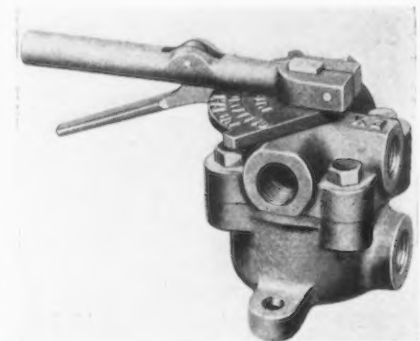
normalizing temperature; the second, in which the axles are allowed to cool below the lower critical range point; the third, in which the axles are reheated to the right temperature for quenching.

When the axle is discharged from this battery it is conveyed at once to the special axle-quenching machine (patented), in which axles are clamped and held in position during the quenching period, thereby controlling the distortion that would otherwise occur at this vital point in production. After quenching, the axles are cleaned of all scale and then sent to the drawing furnace. This drawing furnace discharges directly into the machine line, where the final operations are performed.

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Four-Way Air Valves for Molding Machines

MORE rapid foundry molding by the jolt-squeeze or draw-squeeze machines is said to be made possible by the Nopak four-way air valve, brought out by the Galland-Henning Mfg. Co., Milwaukee. A throw of the



safety handle to one side operates the jolt mechanism; or, to the opposite side, operates the squeeze. It is pointed out that as the valve handle does not have to be held in either the jolt or squeeze positions, both hands of the operator are left free for work and the time required for each mold is reduced. Furthermore, as the valve handle does not operate against the air pressure of the line, less effort is required to operate the valve and there is less fatigue of the operator. Freedom from leakage is another feature emphasized for the valve. Standard sizes include $\frac{3}{8}$, $\frac{1}{2}$ and $\frac{3}{4}$ in. pipe openings; other sizes may be obtained on order.

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Chicago Bridge & Iron Works, Chicago, has moved its Dallas, Tex., office, in charge of H. B. Murphey, to the Burt Building.

Air Line Stop Cock Has Flexible Diaphragm

A FLEXIBLE diaphragm is employed in a new type of stop cock brought out by the Westinghouse Traction Brake Co., Wilmerding, Pa., for use on industrial plant air lines. Operation of the device is indicated by the accompanying sectional view. Only a slight pressure on the screw is necessary to obtain an air-tight

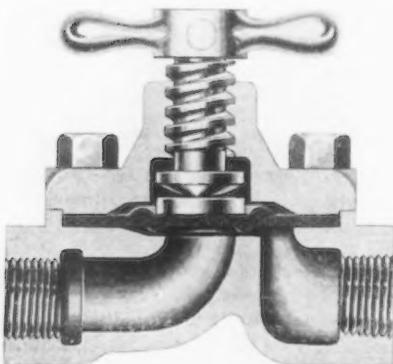
closure. If it is desired to release air from the delivery side of the line when the cock is closed, a vent passage may be provided. In this case, leakage from the vent when the cock is in the open position is prevented by the upper annular rib of the diaphragm which seals the cap, thus closing the relief passage. In this way the cock serves both as a supply valve and a release valve. The only upkeep involved is an occasional replacement of the special composition diaphragm.

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Heat-Treating Furnace With Three-Zones

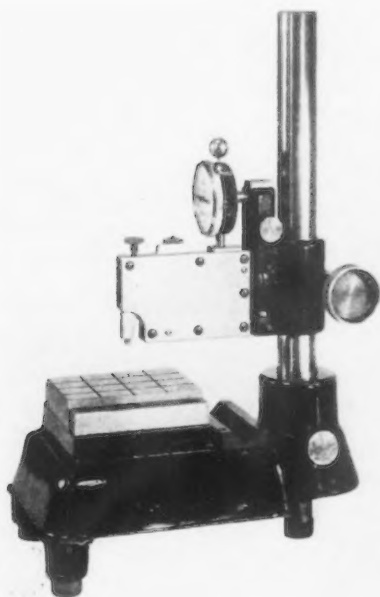
A NEW heat-treating furnace designed for use of the Logan Gear Co., Toledo, Ohio, for production of a tubular front axle for automobiles, has some interesting features. The furnace is of the automatically controlled gas-fired type, in which time and temperature are held to a definite point.

This battery of furnaces has three zones: the first, in which the axles are heated to and held at the proper



Amplifying Comparator for General Use

Amplifying mechanism of simple construction is a feature of the precision amplifying comparator marketed by the Precision Gage & Tool Co., Dayton, Ohio. A close-coupled two-piece movement mounted on hardened knife edges is employed and



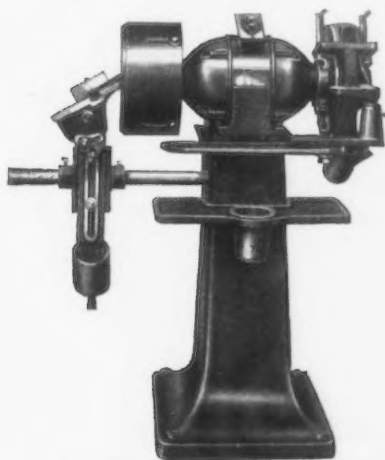
there are no bearings, pins, trunnions or springs. This movement is inclosed in a dust-proof case, and the action is said to be such as to eliminate lost motion and to produce amplifying action that is positive, accurate and sensitive. Wear ordinarily is negligible, but compensation for slight wear has been provided. The amplifying ratio is 10 to 1 in the standard equipment.

The indicator dial, on which the amplified movement is read, is graduated in half ten thousandths and has a range of 0.013 in. Work up to 8½ in. in height may be gaged when placed on the platen, and work 14 in. in height may be gaged from a surface plate. The platen or anvil is adjustable to accommodate work of odd shape, and special fixtures can be mounted conveniently in place of the regular platen. The rear foot of the three rubber tipped feet on which the instrument is supported is adjustable so that the entire assembly may be tilted backward, bringing the platen and work to a more convenient angle for observation.

The small ball point at the extreme tip of the comparator arm is tipped with stellite and is about 3/16 in. in diameter, a size that permits measuring close to shoulders or in the bottom of slots. A diamond tip is furnished as an extra. The instrument is mounted on a heavy base that measures 6 x 10 in.

Grinder for Tungsten Carbide and Other Tools

AGRINDER for sharpening tungsten carbide and high-speed steel tools has been placed on the market by the United States Electrical Tool Co., Cincinnati, Ohio. By means of the adjustable table and sliding guide shown in the close-up view, tools may be held against the cup wheel at any angle desired. This arrangement, it is pointed out, is effective in preventing the operator from grinding away more of the tool than is necessary.



The cup wheel is protected by an adjustable guard. Tools are sharpened as illustrated at the right.

In addition, it is claimed that a proper edge is automatically assured.

A protractor scale is provided for use in making angular adjustments of the tool rest. This table also is adjustable for height and for wheel wear. The machine may be furnished with one cup and one disk grinding wheel, as illustrated, or with cup wheels mounted on each end of the motor shaft. The 2-hp., 1750-r.p.m. driving motor is equipped with push-button control. SKF ball bearings are used. The wheel guard, made of boiler plate, is adjustable for wheel wear.



Portable Gage for Testing Steel Balls

STEEL balls may be tested accurately both for out-of-roundness and diameter by means of the gage illustrated, which is being marketed by the Coats Machine Tool Co., 110 West Fortieth Street, New York.

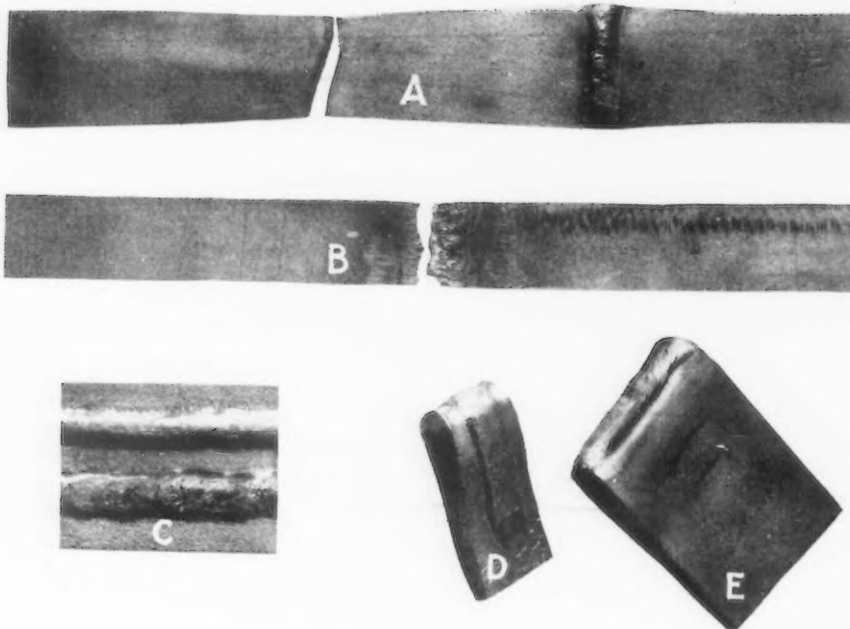
The gage consists of a standard Krupp Mikrotast indicator having either 40 0.00005-in. graduations or 50 0.0001-in. graduations. The indicator connects with an adapter which carries at its lower end a conical Nitralloy cup. The top of the cone is cut away to permit projection of the gage contact point into the cup.

The gage is set to a master ball and the steel balls then inspected by simply



placing the gage on the ball, allowing the gage to bear down merely by its own weight. It is common practice to support the balls on a glass plate; by rolling the ball over the glass plate, without raising the Mikrotast gage, any out-of-roundness can be quickly detected. Red tolerance markers on the dial facilitate reading and avoid eye-strain. Four adapters to permit inspecting balls ranging from 0.400 to 1.200 in. in diameter are provided.

Hill Clutch Machine & Foundry Co., Cleveland, has moved its New York office to 90 West Street. Arthur L. Whiteside is in charge.



New Electrode for Stainless Steel Arc Welding

ARC welds of stainless steel, in which the deposited metal is said to be as resistant to corrosion as the parent metal, may be made by use of the improved "Stainweld A" extruded electrode, a new product of the Lincoln Electric Co., Coit Road and Kirby Avenue, Cleveland. As the coating of this electrode contains no carbon (often used as an arc stabilizer), there is no possibility of the molten metal absorbing carbon from the coating during the welding process. The deposited metal, therefore, will have a carbon content equal to or less than that of the metal being welded—a factor of importance, since a slight increase in the carbon content of stainless steel permits more rapid corrosion.

The new electrode is designed to provide a shielded arc preventing the combination of atmospheric oxygen and nitrogen with the molten weld metal to form oxides and nitrides in the weld. Welds are made with the usual polarity of welding current reversed.

High tensile strength, ductility and resistance to corrosion are indicated by the results of tests on the sample welds shown in the accompanying illustration. Tension tests were made on coupons A and B; the former broke in the plate at a considerable distance from a weld, ground flush on one side. The maximum tension of the plate was 96,000 lb. per sq. in. The cross-sectional area of the weld metal in sample B was reduced below that of the plate in order to obtain a break in the weld. This rupture occurred under a tension of 96,800 lb. per sq. in.

Comparative tests of corrosion

caused by immersion in aqua regia were made on coupon C. The lower weld, made with an electrode the coating of which contained a small amount of carbon, was badly pitted. The upper weld, produced with the new electrode, was affected even less than the plate metal. Bend tests, showing high ductility, were made on coupons D and E.

"Stainweld A" electrodes are obtainable in 3/32, 1/8, 5/32, 3/16 and 1/4-in. sizes of the regular 11-in. lengths.

Plug Type Valve for Fuel Oil Supply

A PLUG type valve for regulating fuel supply to oil-fired furnaces either by manual or automatic means is manufactured by the Automatic

Temperature Control Co., 34 East Logan Street, Philadelphia. Rugged construction, simplicity, ease of adjustment, and freedom from clogging are features emphasized.

A key is furnished for locking the valve lever in position and also for setting the valve, fine adjustment being facilitated by the fine thread of the adjusting screw. The amount of valve opening is indicated by a dial and index that permit previous settings to be duplicated quickly.

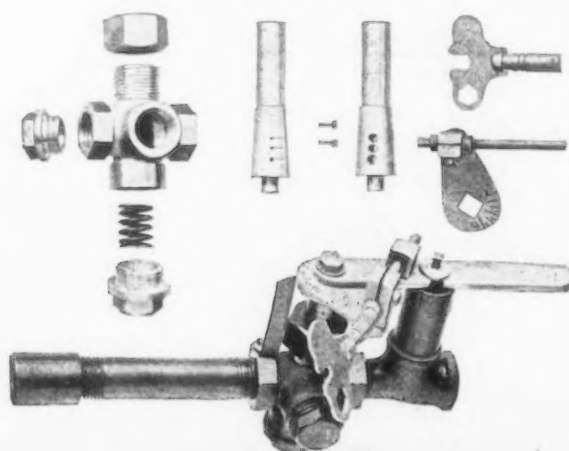
Under normal operating conditions, oil flows through one or more of three tapered, 60-deg. V-grooves machined on the circumferences of the plug. These grooves terminate in holes drilled through the plug by Nos. 52, 46 and 41 sized drills respectively. It is pointed out that the capacity of the valve may be altered, without removing it from the line, by plugging the holes not needed. Orifice screws are provided for this purpose.

With 20 to 30 Baumé oil at 60 deg. F. and under a pressure of 25 lb. per sq. in., a maximum fuel demand of 30 gal. per hour can be handled. With the same oil conditions, this capacity may be increased to 120 gal. per hour by opening all three of the orifices.

Because the cross section of the smallest opening through which oil must pass is in the shape of an equilateral triangle, particles of sediment of comparatively large size are said to pass freely. Should clogging occur, however, the valve may be quickly flushed by loosening the locked valve lever, swinging it fully open and again locking it in its original position. If this does not free the valve, the stem may be turned to the fully closed position, the side cap removed, and a fine wire inserted through the orifice.

The heavy spring, shown among the parts at the left in the accompanying illustration, maintains a uniform pressure from below on the tapered plug which has a ground fitting in the valve body. This arrangement is described as preventing any possibility of the plug seizing or of oil leaking past the grooves. The valve stem is gland packed and oil flow may be in either direction.

CONTROL of oil flow by V-grooves in a tapered plug minimizes danger of clogging. A dial indicates the amount of valve opening.



LOOKING IN?

LOOK OUT!

A CHINESE philosopher determined to keep his son free from the world's contamination. He built a high wall around his property so that the boy could neither climb nor see over it. Within these confines the youth occupied himself with the care of an olive grove.

One day mischievous lads, curious to see and tease the imprisoned youth, brought ladders and climbed to the top of the wall. Then they lowered a huge green melon on a string, telling the isolated boy to compare his puny olives with the sort that were raised outside.

That night, the lad hanged himself from the branch of an olive tree, heartbroken at his apparent failure.

Conditions and customs are continually building up Chinese walls around each one of us. And to keep our perspectives, we must be continually tearing them down. This is particularly true in the case of industrial executives.

Take, for example, the matter of equipment obsolescence. How can one detect it? Not by looking *in*, but by looking *out*.

One can tell little about obsolescence by merely inspecting his own machinery. Age does not tell the story. Under certain conditions, a 15-year-old machine may serve your purpose as well as a new one. But under other conditions, a three-year-old machine may be entirely out of date.

Obsolescence can only be determined by comparing the machinery that you have with the machinery that you *might* have. And the proper basis for such a comparison means that one must tear down the mental wall of tradition that custom builds up without one's realizing it.

Today, more than ever, industry needs the utmost that improved machinery has to offer. Competition demands cost reduction.

Make smooth the paths that will bring you reliable information about such industrial equipment as you might have but have not. Welcome the representatives and the literature that bring tidings of improved equipment. For knowledge is power in the matter of replacement decisions.

And intelligent replacement is the key to tomorrow's profits!

Copies of this insert may be secured from the Reader Service Department of THE IRON AGE, 239 West 39th Street, New York.

Previous recent editorials in this series appeared in the following issues of THE IRON AGE:
March 12, March 19, April 9, April 16, April 23, April 30, May 7, May 14.

By
JOHN H. VAN DEVENTER
Industrial Consultant
The Iron Age

The Iron Age, May 21, 1931—1683



A night view of the plant of the Illinois Steel Co. at Ninety-second Street and Ewing Avenue, Chicago, with the reflected light upon the Calumet River.

OPEN-HEARTH MEN TALK OVER THEIR OPERATING PROBLEMS

OPENING the thirteenth semiannual meeting of the open-hearth committee of the American Institute of Mining and Metallurgical Engineers, Leo F. Reinartz, the chairman, spoke of the move under way to tie the committee in more closely with the institute. To this end, a board of nine men has been appointed of whom three will retire each year, three more men being appointed to take their places. For the beginning, this committee will include the following:

Mr. Reinartz, works manager, Middletown plant, American Rolling Mill Co.; E. L. Ramsey, open-hearth and blooming mill superintendent, Wisconsin Steel Co., South Chicago; J. M. Hughes, general superintendent, Sharon Steel Hoop Co., Lowellville, Ohio; W. E. Buck, metallurgist, Granite City Steel Co.; C. L. Kinney, Jr.; C. H. Herty, Jr., physical chemist, United States Bureau of Mines, Pittsburgh; H. B. Hubbard, superintendent of open-hearth, Inland Steel Co., Indiana Harbor.

A welcome to the city of Chicago was voiced by Mr. Axtell, on behalf of the "Century of Progress Committee," working on the forthcoming World's Fair. He made a plea for the cooperation of the iron and steel industry in the show of industrial progress, which is to be made a part of the exposition celebrating the centenary of Chicago.

Following this, Clyde L. Williams of the Battelle Memorial Institute, Columbus, Ohio, gave a résumé of the finances of the committee. He told how, in two years, a \$1,200 deficit had been changed into a surplus of about \$150 through two expedients. One was the collection of a registration

fee of \$5 from each person registering; the other was a condensation of the minutes of the successive meetings. Editing and publication of these minutes constitutes the largest item of expense incident to holding the meetings. Even with the condensation, however, they are growing larger, because of the larger amount of information being given out by the members.

Other Countries Organizing Units

Both Mr. Williams and the chairman referred to the example set by the good work of this committee as having given rise to imitation elsewhere. The copper interests in the institute have been starting similar conferences, and the blast furnace men are about to follow suit. Word has come from England that Edgar C. Evans, of the National Federation of Iron and Steel Manufacturers, has organized an open-hearth committee in Great Britain along similar lines. Mr. Evans attended the fall meeting in 1928 at Pittsburgh and became very enthusiastic over what the committee is doing. Direct contacts are being maintained also with similar units in Germany, France, Italy and Australia.

Registration was 156, besides a few guests—much the largest the organization has ever had.

Furnace Construction

SEVERAL topics were brought up in a report of the furnace construction committee, read by its chairman, G. D. Tranter, American Rolling Mill Co. He spoke particularly of the several methods in vogue for producing

mechanical draft for the furnaces. The Isley method may be had in either the conventional two-stack arrangement or a new arrangement with a single stack, operated by one motor and having butterfly control valves. This new arrangement can be installed for about two-thirds the cost of the two-stack device, and is said to function about equally well.

Induced draft was mentioned, in which a Sturtevant high-temperature stack fan is used. Abrasion from the hot flue gases has been overcome by using alloy steel construction throughout.

Refractories Under Continual Study

A special refractory brick imported from Europe, called Magnesidor, is reported to have given good results. It analyzes about 95 to 98 per cent magnesia. A clay-bond silica brick has been used with mixed or contradictory results. For some purposes these brick have worked out all right, while for others their failure has been very rapid.

It is becoming general practice to use heavier brick for furnace roofs. The intermittent operation of a depression period has shown up the weakness of the suspended-arch roof. After a shutdown it is difficult to heat these roofs up again without trouble.

Two and three-pass checkers are becoming more general. There has been considerable difficulty with the first pass in both of these designs, but particularly in the three-pass arrangement, because of the very high temperatures of the entering gases.

Rebuilding of producer gas furnaces, for the use of fuel oil or natural gas, has been proceeding in some

localities. A very satisfactory operating condition is reported. In one such case, where natural gas is being used, a furnace is making heats of 120 tons in about 11 hr., and with a fuel consumption of 4,400,000 B.t.u. to the ton of ingots. In another case, with a consumption of 4,000,000 B.t.u., about 10 tons an hour is being produced.

Satisfactory operating reports are had with regard to the Rose open-hearth port. It was stated, however, that the original design has been considerably modified in later practice.

Combustion control naturally focuses attention upon the subject of air infiltration. To this end, door frames and the door body are being machined so that they will make a better fit. At the same time, the wicket covers are machined also, for the same purpose.

Experience Records Brought Out

DISCUSSION on this report took up in order a number of the points brought out. A Pratt-Daniels stack damper was reported to give a better fuel consumption by about 10 per cent, but no change in the operating rate of the furnace. Some of the change-over of furnaces to the use of natural gas has been halted recently on account of the cheapness of oil. This fuel is coming more and more into vogue on this account.

Two-pass checkers have been successful in some plants and much less so in others. One operating man reported that the first pass was pretty well burned down after about 150 heats. This section of the regenerator was laid up with $13\frac{1}{2} \times 4\frac{1}{2} \times 3$ -in. clay brick with a 10-in. opening. In the second pass the opening was $4\frac{1}{2}$ in. and there was no clogging. The fuel cost was lower to the ton of steel, but no change was noted in the operating speed of the furnace. Use of this system, however, made a great change in the waste-heat boilers, dropping their output by fully 30 per cent.

A three-pass installation was reported to have given about these same results, both as to the waste-heat boilers and as to burning out the brick in the first pass after 165 heats. In this case the first pass had 100 sq. in. of opening, the second pass 64 sq. in., and the third 21 sq. in.

It Can Be Made to Work

To offset these reports was one in which a furnace with two-pass checkers made 739 heats without burning out the brick. The first gas pass next to the slag pocket opening had burned enough so that the passage was about 50 per cent larger than when new. The superintendent, however, expressed the opinion that this section could have made another 150 heats. However, the air passages became plugged up and the furnace had to be taken off.

In this instance the gas checkers

were run at a temperature of 2000 to 2200 deg. F., and the air checkers at 1500 to 1700 deg. The opinion was expressed that better results could have been obtained if the furnace could have been run with a short flame, to avoid carrying over particles of solid matter from the fuel. This would presuppose not too much draft, so that the solids would be deposited in the slag pockets and down-takes and thus not reach the checkers. These checkers were laid up in the old style, with $6\frac{1}{2} \times 6\frac{1}{2}$ -in. openings, and mixed gases were used.

One case was reported of a furnace designed for 120-ton heats and being charged for 225 tons. This furnace is only 68 ft. long over all. Because of these conditions, it has to be driven very hard and gives trouble.

Large Regenerators Advocated

A plea was made for large checker chambers on the theory that a higher temperature gives less dirt. This temperature should be about 2150 deg. This speaker reported having seen a producer gas furnace operating in this manner, giving 163-ton heats on 340 lb. of coal to the ton. The furnace and regenerators are very well insulated and the checker chambers are deep. After 200 heats the checkers were still quite clean.

In another case, with a 54-sq. in. opening, a fuel consumption of 29 gal. of tar to the ton was reported with a flame so short that it never went past the middle door. After 170 heats the slag pockets were cleaned out and the checker chambers blown out. The regenerators looked as if they would take two or three more periods of 170 heats before they would have to be torn down.

One man operating a steel foundry furnace reported a method of cleaning checkers which aroused considerable interest. Every Saturday morning he gets after them with a portable sand-blast outfit. He has a nozzle on the end of the hose and uses 400 or 500 lb. of sand. The brick are 9 in. with a 36-sq. in. opening, on a 25-ton furnace. This method is reported to permit running the bricks in the regenerator for two or three furnace campaigns.

Refractories and Insulation

WHEN installing insulation on regenerators, one speaker said that it often is necessary to tear out

all of the red brick outside the fire brick, and then plug or smear over the holes and cracks between fire brick, before proceeding to lay up insulation. Then from 3 to $3\frac{1}{2}$ in. of insulation is placed outside the red brick.

As this increases the heat storage in the fire brick, it correspondingly increases their expansion. There is thus a tendency, from the thrust of the arch, to push over the center wall between the two chambers. To equalize these thrusts, it is found necessary to get a higher arch in the air chamber and a flatter arch in the (narrower) gas chamber.

Report was made of a test of the heat flow through insulated walls. No less than 34 thermocouples were used at various places and with differing penetration into the wall. It was found that the heat penetration between reversals of the furnace was about $4\frac{1}{2}$ in. into the fire-brick wall. From that depth to the outside the temperature does not change with reversal, but remains approximately uniform at a definite value. Insulating material for such places as the fantail has to be of very high quality, because of the high temperature there encountered.

Substantial Savings Reported

Benefits from insulation were variously reported. In one case a saving of 4 or 5 gal. of oil to the ton of steel was noted, with no change in operating rate. In this instance it was found that the furnaces would last about twice as long. Other furnaces in the same plant, where additional improvements were made besides insulating, showed a saving as high as 10 gal. Still further saving could have been achieved if the regenerators had been insulated underneath, as it was felt that a great deal of heat is dissipated into the ground.

Another man reported a saving of 5 per cent on his fuel through smearing insulating material in good thickness over the roofs and walls. Still another reported putting insulation and steel jacket over an old furnace, with a 10 per cent saving in both fuel and time.

Roof Insulation a Lively Topic

Insulation of roofs of furnaces came in for considerable discussion. One man reported that the outside surface of his roof gets as high as 1700 deg., but he cannot see that it has done any harm. Another man, with foundry furnaces, has put on one roof of Sil-cel and has put boiler plates over the sides. No changes except insulation were made, but the furnace has been speeded up considerably and there was a saving of 4 or 5 gal. of oil.

One large furnace had its roof insulated after 125 heats had been made and then ran 456 heats. This was found to require less repairs than any other furnace in the shop. Weber's 241 was thrown on wet, all over the

(Concluded on page 1719)



American Industrial Activity Since 1854

THE Cleveland Trust Co., Cleveland, has made a research study of the business cycles of American industry during the past 78 years, and the results are embodied in the chart reproduced on this page.

Figures below the diagram show for each month during this long period the per cent by which industrial activity rose above normal or declined below it. The light dashed line running through the diagram represents the course of wholesale prices if the average for 1929 is taken as equal to 100. The scale for the wholesale prices will be found just inside the right hand end of the diagram. An explanation of the chart says:

"During this long span of years there have been 13 well defined periods of serious depression, of which the present one is the most severe. In January of 1931 industrial activity declined to 28.3 per cent below normal. The next lowest record is that of the depression of 1921, which reached a low point of 27 per cent below normal. None of the previous depres-

sions carried the records of industrial activity beyond 20 per cent below normal. By far the longest depression was that of the '70's, which lasted for nearly six years.

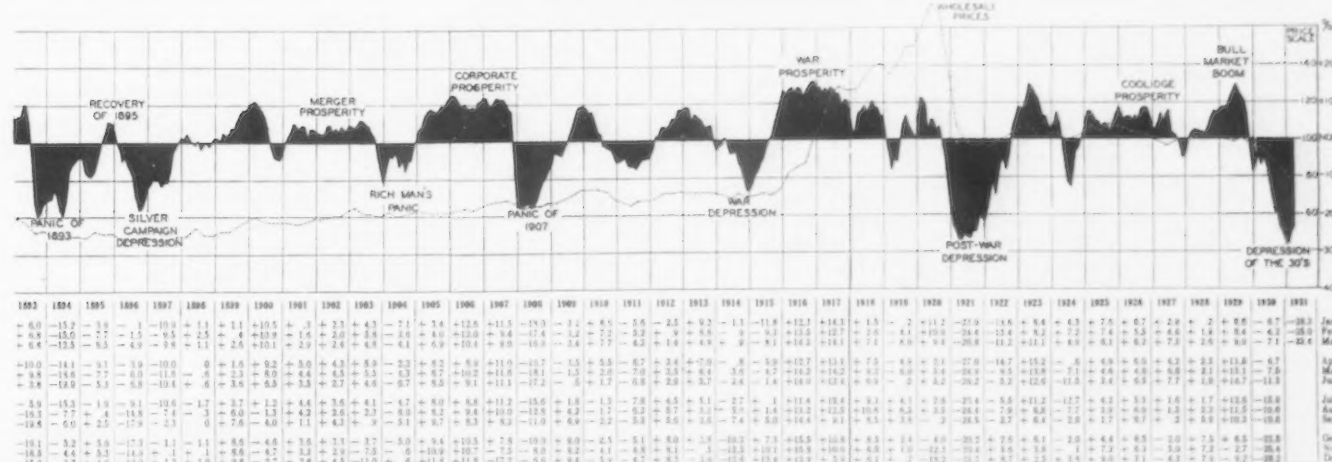
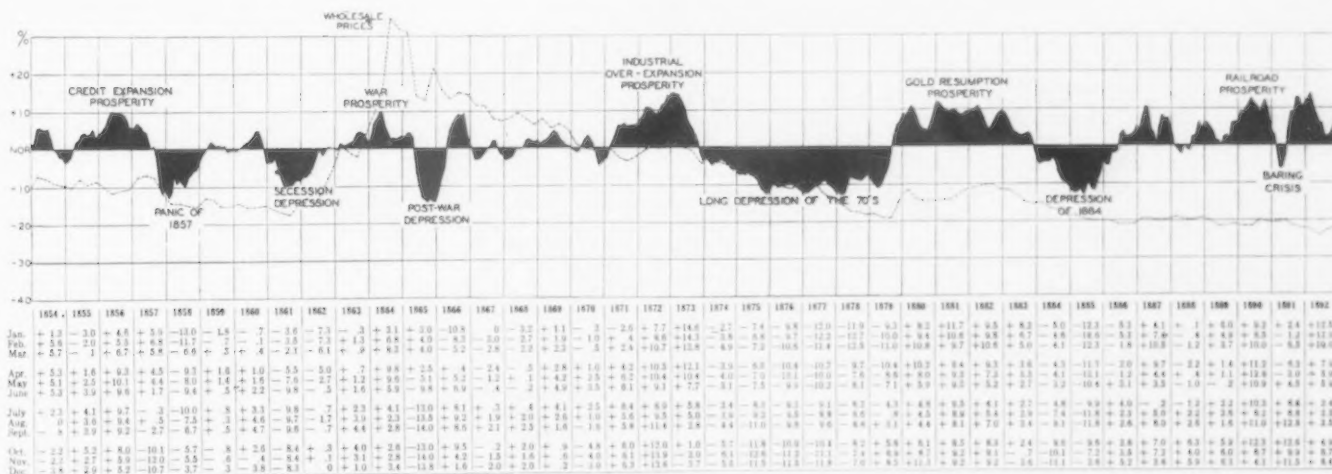
Price Decline Followed Civil War

"This piece of statistical research carries the detailed records of American business cycles back nearly 25 years further than does any previous piece of work in this field. It extends the records so as to make possible a study of our business cycles during the years prior to, and following, the Civil War. During that war wholesale prices rose to the same degree that they did during the World War, and then entered upon a long decline, much as they have in the years following the recent war. The diagram makes possible the comparative study of the business cycles during the two periods of declining prices following the two periods of war inflation.

"The index is composed of 10 series of annual data from 1854 to 1901. The fluctuations above and below normal

were computed for each series separately, and the 10 were then combined in one. Normal values for each series were means between one set of lines running from one prosperity peak to the next, and another similar set of lines running from each depression bottom to the next. The annual figures from 1901 to 1919 are those of the Thomas index of manufacturing production with mineral production added, and from 1919 to date the monthly figures of the Federal Reserve (Thomas) index of industrial production have been used. All the data were reduced to a per capita basis.

"The computations of the fluctuations of each of the 10 series constituting the index from 1854 to 1901 were carried through to include 1930, and the coefficient of correlation between each of them and the production series running from 1901 through 1930 was computed. Each of the 10 series was then given a weight based on its degree of correlation with the production series. The 10 series with



their effective weights are pig iron consumption 21, blast furnace activity 16, canal freight (New York and Sault Ste. Marie) 12, railroad freight ton-miles 10, cotton consumption 9, rail production 9, coal production 8, construction of miles of new railroads 7, locomotive production 6, and ship construction 2. The 10 series combined give results closely similar to those of the production series for the overlap period from 1901 through 1930. The heights of prosperities and the depths of depressions are closely alike in the two series. The coefficient of correlation for the period is 0.95. Their average deviations for the period are equal.

"When the annual data were determined the monthly data were fitted to them. These monthly data were based on the figures of the business index of the American Telephone & Telegraph Co., and on data for blast furnace activity from 1877 to 1919. Monthly data for bank clearings and for stock prices were used from 1861 to 1877, and those for security and commodity prices from 1854 to 1861. The index used is that of Professors Warren and Pearson (Cornell), recomputed so that the average for 1929 equals 100."

Have Reached Depression Bottom

In discussing the current outlook, Col. Leonard P. Ayres, vice-president of the trust company, said:

"It is probably true that in so far as industrial production is concerned the reaching of the bottom of this depression has already ceased to be a matter for prophecy, and has become one of history. The figures of the Federal Reserve Board probably furnish the most accurate available measurements of the physical volume of industrial output in this country. They tell us that, if we consider the average national production of industrial goods during the three years of 1923, 1924 and 1925 as being equal to 100, the output rose to 126 in June of 1929, and then started on the long decline that carried it down to 82 by last December. That was a fall of 35 per cent.

"Since last December industrial production has been increasing, and by March it had advanced six points to 88. It seems quite unlikely that it will return to its December low point, and we are probably justified in concluding that business has reached the bottom of the depression, and is now bumping along there. The crucial question concerning this depression is no longer that of its depth, but rather that of its probable duration. The answer depends on so many changing factors, both domestic and foreign, that the outcome cannot be clearly foreseen.

"Many of the readjustments that are prerequisites to recovery have been completed, and others are under way, but little progress has so far been made toward solving some of our most difficult fundamental problems. One of these is how to maintain high in-

dustrial wages in a country in which agricultural incomes are sharply curtailed, and in a world in the rest of which the prices of industrial products have dropped, and the wages of industrial workers have declined.

"A second problem is how to continue to receive payments on our foreign loans and investments while decreasing our imports and restricting our foreign lending. A third problem is how to conserve the values of the many billions of dollars worth of railroad securities on which our insurance companies and mutual thrift institutions largely depend, when the traffic rates permitted by Federal regulation are insufficient to meet the operating costs and fixed charges of many of the roads."

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Open-Hearth Men Visit Illinois Steel Plant

Fourteen open-hearth furnaces in the new equipment program of the United States Steel Corp., were inspected at the South Works of the Illinois Steel Co., South Chicago, Ill., on May 12, by 75 men attending the Chicago meeting of the open-hearth committee of the American Institute of Mining and Metallurgical Engineers. Of these furnaces, six were in operation, making their first runs, and averaging about 2450 tons a week per furnace. They are running continuously, with only enough shut-down at the end of the week to blow out the flues.

Each furnace measures 48 ft. long on the surface of the bath and 17 ft. 7 in. wide, and has a bath 2 ft. 9 in. deep. Nominally of 150 tons capacity, they are running as high as 175 tons, and averaging perhaps 165 tons. They are set on 103-ft. centers and are 85 ft. in length over the dog houses, leaving 18 ft. clear between furnaces.

There are five large charging doors, the central door being of extra large width—4 ft. 6 in. This makes it possible to charge large ingot molds or other heavy pieces of scrap. Heats are made in from 10½ to 11 hr. on cold metal, as well as on hot metal.

Insulation of Checkers

All regenerator chambers are insulated with Johns Manville material and sealed in with steel plate—top, as well as sides. Some of the plates are removable, for cleaning or renewing checker brick. There is an expansion joint running diagonally on the long side of each chamber. Checker brick 10 in. x 4½ in. x 2½ in. are laid up with 7-in. openings, giving 49 sq. in. The brick run to a height of about 13 ft., with about 3 ft. 6 in. of tile underneath and a 12-in. rider brick above the tile. This makes a total height of checkers of about 17 ft., of

which some 5 ft. is below the floor level.

Blow-Knox water-cooled valves are used and there are waste-heat boilers of the fire-tube horizontal type, made by the Babcock & Wilcox Co. These furnish steam at 275 lb. pressure, which is used in the power plant, a short distance away.

A typical charge noted on one furnace included 158,700 lb. of scrap, 35,000 lb. of cold pig iron and 160,000 lb. of hot metal; together with 36,000 lb. of limestone, or a little more than 10 per cent.

Unusually large dolomite guns and heavy floor-type charging machines are in use. Ladle cranes are of 225-ton capacity, while those over the charging floor, handling the hot-metal ladles, are of 125 tons. Building construction is exceptionally sturdy and the layout is roomy. The top of the monitor is about 110 ft. above the pit level.

All 14 furnaces are in a row, with the hot-metal mixer equipment at one end of the long line. Back of the charging floor are bins, with track layout (narrow-gage) to accommodate the switching of cars of materials to any furnace desired.

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Machinery Exports to Europe Best Since 1920

Exports of industrial machinery from the United States to Europe during 1930 reached the highest level since 1920, according to the Commerce Department's Industrial Machinery Division.

European purchases of American industrial equipment totaled \$89,125,000 in 1930, compared with \$78,787,000 in 1929 and \$63,830,000 in 1923. In each of the three years Europe has surpassed all other areas as a market for American industrial machinery. The significance of the increase in a depression year is considered by trade leaders as particularly striking in view of the highly competitive conditions existing in Europe.

Soviet Russia was the leading European market during 1930, accounting for \$39,792,000, compared with \$13,738,000 in 1929, thus nearly trebling its purchases from the United States. The United Kingdom ranked second among European purchasers of American equipment, with a total of \$22,153,000, against \$26,538,000 in 1929, or a decline of approximately 16 per cent. France ranked next among European markets, with purchases amounting to \$8,457,000, compared with \$21,006,000 in 1929, followed by Germany with \$5,344,000, in comparison with \$7,093,000.

Total exports to all countries of industrial machinery from the United States during 1930 were valued at \$220,913,000, compared with \$257,085,000 in 1929.



WANTED: CREATIVE IDEAS

THE automobile and building industries, it is now recognized, provided the chief stimulus for our period of post-war prosperity. The motor car offered such obvious advantages in terms of convenience and pleasure that the desire to own one became virtually universal. Automobile ownership greatly widened the field for suburban life and, together with the building shortage that accumulated during the war, gave a sharp impetus to construction activity in general.

Now the novelty of possessing a car or a suburban home has worn off. New wants must be created to give industry its next push forward. New products or old products in a new form are needed. The present low state of trade is not due to mechanization, declares Charles F. Kettering, General Motors Research Corp., but rather to stagnation of ideas.



NO LONGER WAITING FOR GEORGE TO DO IT

OUR machinery market summary reports that many manufacturers recognize that they need new equipment but are postponing purchases until there is a change in the general business situation. This attitude is typical of prospective buyers of most commodities. Everybody is waiting for someone else to take the initiative. Who will start the ball rolling?

At least one important group of executives, the National Machine Tool Builders' Association, has decided that the time for action has arrived. At its spring meeting at Old Point Comfort, Va., it launched a nation-wide modernization campaign, which will have the united support of the Associated

Business Papers. The menace of obsolescence, which has been consistently fought by THE IRON AGE, will now be attacked on a wide front.



HIGHER FREIGHT RATES?

THE problem of the railroads is acute, not alone because of the depression but because of the encroachments of other forms of transportation. Are higher freight rates the way out?

This question is likely to be to the fore in Washington very soon in the plan which the carriers will lay before the Interstate Commerce Commission to raise their revenues. Industry, which pays the freight, is also struggling for a margin of profit, but at the same time is vitally interested in the prosperity of the railroads. Somebody has got to pay the freight if the railroads are to prosper, but the question is who.



WAGE REDUCTIONS

WILLIAM GREEN, president, American Federation of Labor, comes out strongly against wage reductions. He goes so far as to charge the bankers with "coercion" in seeking to deflate labor. President Hoover, Secretary Mellon and others of the Washington Administration have taken a stand against reducing wage rates, and so have many industrial leaders.

But, meanwhile many plants have put reductions into effect. After a four days' strike, a second wage cut at the Empire Steel mills at Mansfield, Ohio, was withdrawn by the management. The wage discussion has become widespread and may be expected to be heard at the spring meeting of the American Iron and Steel Institute this week.

"A BIRD IN THE HAND IS—"

AUTOMOBILE makers refuse to count their chickens before they hatch. They are regulating output in close conformity with sales. In April General Motors sold 132,629 cars to dealers, while the dealers sold 135,663 cars to users. An actual shortage of certain models of a light car has developed.



WHERE BUSINESS IS IMPROVING

ALL business is not on the downgrade. Shipments of a Detroit pig iron house are running 15 per cent ahead of those of April. And this gain is not entirely from the automobile industry. Foundries making castings for the electric refrigerators, stoves and other products are using more metal. . . . Chevrolet will increase the capacity of its Saginaw malleable foundry 50 per cent. The expansion program is to be completed within four months.



OUR DEEPEST DEPRESSION

INDUSTRIAL activity has dropped lower in this depression than in any previous depression in the past 78 years, says Colonel Ayres. In January of this year the decline reached 28.3 per cent below normal. In the 1921 slump bottom was reached at 27 per cent below normal. In none of our other serious depressions—11 in all—was the recession more than 20 per cent. We have no way to judge the future except by the past.

Labor Leader Charges Bankers Seek Wage Rate Reductions

William Green, President American Federation, Declares Deflation Arguments Smack of "Coercion"

WASHINGTON, May 19.—President William Green of the American Federation of Labor in an address this afternoon at Houston, Tex., before the convention of the Brotherhood of Railroad Trainmen, declared that the federation "will stand uncompromising and immovable against all attempts to lower living standards through the imposition of reductions in wages." His remarks were looked upon as being the strongest Mr. Green has made since becoming head of the federation and were interpreted as a warning against wage reductions, which, he declared would be followed by evil consequences.

He charged banking groups with seeking wage reductions. Against them he arrayed President Hoover, Secretary of the Treasury Mellon and other cabinet members, prominent industrial leaders, such as President James A. Farrell of the United States Steel Corp., President Gerard Swope of the General Electric Co., railroad executives, large building contractors and others.

Mr. Green said that labor representatives interpret the statements "recently made by Mr. Wiggin of the Chase National Bank, Mr. Roberts of the National City Bank of New York, Mr. Stephenson, representing the American Bankers' Association and Melvin A. Traylor of the First National Bank of Chicago" as attempts to enforce a general reduction in wages.

Says Coercion Is Being Used

"This," said Mr. Green, "is coercion of a most reprehensible character."

"Reports have reached the headquarters of the American Federation of Labor that some bankers have refused to extend credit to manufacturers unless they reduced wages."

After citing the attitude of President Hoover, his cabinet officials, industrial leaders and others as being opposed to wage reductions, Mr. Green said:

"Who is most competent to judge as to whether the maintenance of existing wage standards or a reduction in wages would hasten a return to prosperity? Shall the opinion of large employers of labor and the representatives of labor prevail or shall it be the opinion of banking and financial interests?"

"If bankers and their sympathetic friends were right the bituminous coal industry, which is on the verge

of bankruptcy, ought to be the most prosperous of all American industries."

It was charged that "Through the coercion of certain bankers the bituminous coal industry has been 'deflated' and as a result the bituminous coal industry is in a worse economic condition than the agricultural industry."

"It is most extraordinary," said Mr. Green, "that bankers should demand that other industries become deflated, that wages be reduced and, as a result, employers and workers be reduced to the distressing, miserable economic level reached by the bituminous coal industry. Bankers have proved themselves mighty poor doctors in treating the economic ills of the bituminous coal industry. They should not be permitted to prescribe for other industrial patients."

Wickwire Spencer to Close Spencer Plant

Effective June 1, the Wickwire Spencer Steel Corp. will discontinue the manufacture of wire at its Spencer, Mass., plant and will move the equipment to the Worcester and Palmer, Mass., and Buffalo plants. The Spencer plant was established in 1820 by Richard Sugan and later conducted by Harry G. W. Goddard as the Spencer Wire Co. until the Wickwire interests took it over about 10 years ago.

Empire Steel Strike Settled; Cut Withdrawn

A strike of 1600 employees of the Mansfield, Ohio, mills of the Empire Steel Corp., after four days' duration, was terminated May 16 by an amicable settlement under the terms of which the company agreed to restore the wage scale that was paid prior to April 1. The company announced a 10 per cent reduction May 1, and on May 11 announced that this would be increased in some departments to 15 per cent. The plants are operated on an open shop basis.

A compromise was agreed to on a demand that the wages of common labor should be increased to 40c. per hr., the men accepting a 36c. per hr. rate, an increase of 4c. per hr.

A committee representing the company and a committee appointed by the employees will be named to discuss grievances, this having been agreed on in the strike settlement. These committees will take up the matter of adopting a satisfactory wage rate covering sheet seconds. It will also consider demands of the employees that wages be figured on a bi-monthly sliding scale, based on the selling price, and that day crews work a maximum of 10 hr. and night crews 12 hr.

During the progress of the strike officials of the Amalgamated Association of Iron, Steel and Tin Plate Workers made efforts to enlist the men into their union, but made little headway.

Government Will Not Stop Eastern Steel Sale

WASHINGTON, May 19.—Purchase by the Bethlehem Steel Corp. of the plant of the Eastern Steel Co., Pottsville, Pa., does not involve violation of the law so far as disclosed through an investigation by the Department of Justice. It was stated today at the department that the foregoing position of the department was announced by John Lord O'Brian, assistant to the Attorney General, in answer to a protest against the sale made by Representative Brumm of Pennsylvania.

Mr. Brumm first took the matter up with President Hoover and was referred by the Chief Executive to the department.

The Representative had charged that the purchase of the Eastern Steel Co., in receivership for some time, constituted a violation of the anti-trust law. Declaring that he appeared for citizens of Pottsville through its Chamber of Commerce, Mr. Brumm sought to prevent scrapping of the plant. He claimed that the Bethlehem company, which intends to salvage the machinery only, had bought the plant at an "exorbitant" price through A. L. Luria, Reading, Pa., scrap dealer, and prevented citizens of Pottsville from taking it over and operating it. Dismantling of the plant, Mr. Brumm said, would throw from 600 to 1000 employees out of work and suppress competition. It was stated that through his suggestion Senator James J. Davis of Pennsylvania sent telegrams to Chairman Charles M. Schwab and President Eugene G. Grace of the Bethlehem company asking their aid in permitting Pottsville citizens to repurchase the plant.

The Eastern Steel Co. was placed in receivership at the request of bondholders and sale of the plant was authorized. The sale was confirmed by the United States District Court at Philadelphia.

The Department of Justice is said to have told Mr. Brumm that it has no power to either stop or sanction dismantling of the plant.

Demand for Higher Freight Rates Expected from the Railroads

Washington Watching with Interest for Plan That Will Increase Carriers' Revenues \$400,000,000 a Year

By L. W. MOFFETT

WASHINGTON, May 19.—The plan which the railroads will lay before the Interstate Commerce Commission for increasing revenues by approximately \$400,000,000 a year is being awaited with much interest. It is evident that the ways and means can be known only after completion of the investigation ordered by the Association of Railway Executives. The carriers throughout the country insist that they are facing an emergency arising from falling revenues and that it is necessary to improve their financial condition. Claims are made that unless this is done further financing will be extremely difficult, if not impossible, for some of them. One outstanding contention is that securities of some lines will be without a market. The obvious implication is that such carriers would be forced into receivership.

The impending demand for rate changes, which appears to be inevitable, comes in a period when serious problems also face industry which provides the traffic. Like the railroads, industry is anxiously seeking means to increase, or at least preserve, revenues. The carriers manifestly are aware of the fact. For this reason it is assumed they will give careful study to the situation before presenting plans for new rate schedules. While increased rates apparently will be sought, it has been stated that decreased rates also will be proposed. The former, however, may be expected to dominate. Keen competition with motor buses, trucks, automobiles, waterways, pipe lines and to some extent with aircraft has been pointed to as cutting revenues of the rail lines. Records of the Interstate Commerce Commission amply support the point.

Have Made Many Rate Reductions

Instead of raising rates, the railroads have found it necessary to reduce certain rates recently to meet motor bus and truck competition in particular. A number of Western rail carriers have cut passenger fares, designed partially to recover tourist traffic. In this instance, however, some carriers have found the lower rates had no appreciable effect on long-haul business and are restoring rates on this class of traffic, while continuing reduced rates on short-haul rates. Big reductions have been made by railroads throughout the country

on automobiles. Southwestern carriers have slashed rates on cotton. Rates from both Southern and Western fields have been reduced on crude oil and they have also been cut from some points on petroleum products. There are instances of cuts in short-haul rates on scrap iron and steel.

The railroads therefore are confronted with the problem of selection in rate changes, both upward and downward, and of commodities and areas. In iron and steel there is a large and growing movement by water, notably from the Pittsburgh district, the largest iron and steel producing area in the country. To increase rail rates on iron and steel, it has been pointed out, would mean diversion of greater tonnages to other modes of transportation, including both truck and water, and thereby decrease rather than increase the railroads' revenue. To make substantial changes in iron and steel rates in one section or a few areas without revision in the remaining territories, it is argued, would upset the steel rate structure, which the general steel rate case sought to straighten out after long and careful study by the Interstate Commerce Commission. Moreover, the railroads recognize that steel products constitute a not only enormous traffic, but a highly desirable movement that is heavy, concentrated and steady. The commission has pointed out that many steel products do not require special equipment. Large quantities move in open cars. Steel is among the heaviest loading commodities. It averages almost 33 net tons per car. Steel traffic involves small loss and damage claims. The revenue per car is greatly above the average. In a study made in 1920, the railroads showed returns per car for 15 commodities, with steel providing the highest revenue. On movements from Chicago the average revenue per car to Pittsburgh was \$244.08; to Detroit, \$197.41, and to Cleveland, \$215.36. During the investigation of the commission in the steel rate structure, the rail carriers admitted that the general level of rates on steel was relatively high, if transportation characteristics alone were considered. Other industries, of course, also maintain they are bearing their burden of rail transportation costs. The predicament of the rail carriers of charging higher rates with-

out losing business consequently is a difficult one.

Railroads Earning Only 2.07 Per Cent

An adequate transportation system naturally can be maintained only by adequate financial returns. The necessity of the rail carriers in retaining purchasing power so vital to basic as well as secondary industries is equally as clear. Accomplishments of the railroads in building up efficient transportation, in curtailing expenditures, and keeping of wage rates in the face of falling revenue are widely recognized. It is well known that, though forced to curtail purchases during recent months, they went into the market for a long period after the present depression set in, and made purchases which could easily have been deferred, but were negotiated as an aid to stimulate business and maintain employment. Yet mere recognition of these facts and sympathy cannot wipe out interest and taxes. It is estimated that the rail carriers are earning only 2.07 per cent on their investments. Under the Transportation act they are "allowed" a return between 5½ and 6 per cent. The railroads claim they have lost \$2,800,000,000 since 1920 through rate reductions, though those taking issue with the statement argue that it does not give consideration to the loss in business and therefore revenue they would have suffered if lower rates had not been put into effect.

It is conceivable that the proposal of the carriers to develop greater returns may not be confined to rate changes. The coordination of rail, motor and water traffic, acquisition by the railroads of other systems of transportation and other studies now are under way either by the railroads themselves or by them and other transportation interests and the Interstate Commerce Commission. By some there is seen a prospect of requiring that other means of transportation be made to assume certain responsibilities that the railroads face. In this connection those taking this view affect to see significance in a brief filed last week with the commission by the Reading Co., which in effect asked that highway carriers be made to pay a tax of approximately 10 per cent, which was said to represent the difference between taxes paid by the Reading Co. and its highway subsidiary.

Monarch Machine Tool Co., Sidney, Ohio, has moved its Chicago office from 27 North Jefferson Street to 547 West Washington Boulevard. The office remains in charge of M. J. Luther.

Dardelet Threadlock Corp., New York, has granted a license to the Colorado Fuel & Iron Co. for the manufacture and sale of track and commercial bolts and nuts formed with the Dardelet self-locking thread.

Welsh Tinplate Mills See Need of Creating Larger Home Demand

Loss of Export Markets Stressed at Meeting of British Iron and Steel Institute

LONDON, England, May 7.—The importance of developing a larger home demand in the United Kingdom for Welsh tinplate was stressed at the opening of the annual meeting of the British Iron and Steel Institute in London today. Sir Charles Wright, the new president of the institute, traced the development of the Welsh industry from the crude methods at one time in use to the complex and specialized industry as it exists today, lending itself more and more to the application of automatic machinery. "The tinplate industry," said Sir Charles, "constitutes a valuable export of capital and labor, and it relies for approximately 70 per cent of its total trade upon the export markets, therefore being peculiarly sensitive to any rise or fall in the world's prosperity."

Just as in 1890 and the succeeding years the Welsh tinplate manufacturers were forced to realize that an extension of export trade was fundamental to the existence of the industry, so today, as a result of the post-war problems of the world trade depression, they have been forced to

reexamine their position and to realize how essential the development of the home market has become. How far the existence of the tinplate industry in South Wales is likely to be dependent upon the home market is, of course, a matter for speculation, but the Welsh tinplate trade has in mind the fact that the home demand in the United States, which has increased enormously since 1890, constitutes the underlying reason for the existence of the present large American tinplate trade.

Welsh Mills Losing Export Markets

Sir Charles said that the Welsh tinplate industry is now faced with a new set of circumstances because of the fact that certain countries, which formerly provided good markets for Welsh plate, have become producers themselves and some of them have even become competitors in the world markets. He urged that the industry continue to pay attention to technical research, and as a result of the work already done along this line it was pointed out that the output in 1929, which amounted to 879,844 tons, in-

clusive of black plate and terne plate, represented the highest ever attained by the Welsh mills, although the industry was working at less than 75 per cent of capacity.

Development of a home canning industry would have an important bearing, it was said, on the future of the Welsh tinplate industry. But the important requirements, it was emphasized, are the creation of new outlets for tinplate and the sinking of personal rivalries in the desire for a rational organization of the industry.

The meeting was opened with Prof. Henry Louis, the retiring president, in the chair. The council's report showed a decrease of 15 members between Dec. 31, 1929, and Dec. 31, 1930, but the stability of the institute was regarded as satisfactory in view of the conditions prevailing. The council's report mentioned that James A. Farrell of New York, president, United States Steel Corp., had been elected honorary vice-president of the institute.

A paper read by Dr. Otto Cromberg of Dusseldorf, Germany, considered the scientific organization of manufacturing operations.

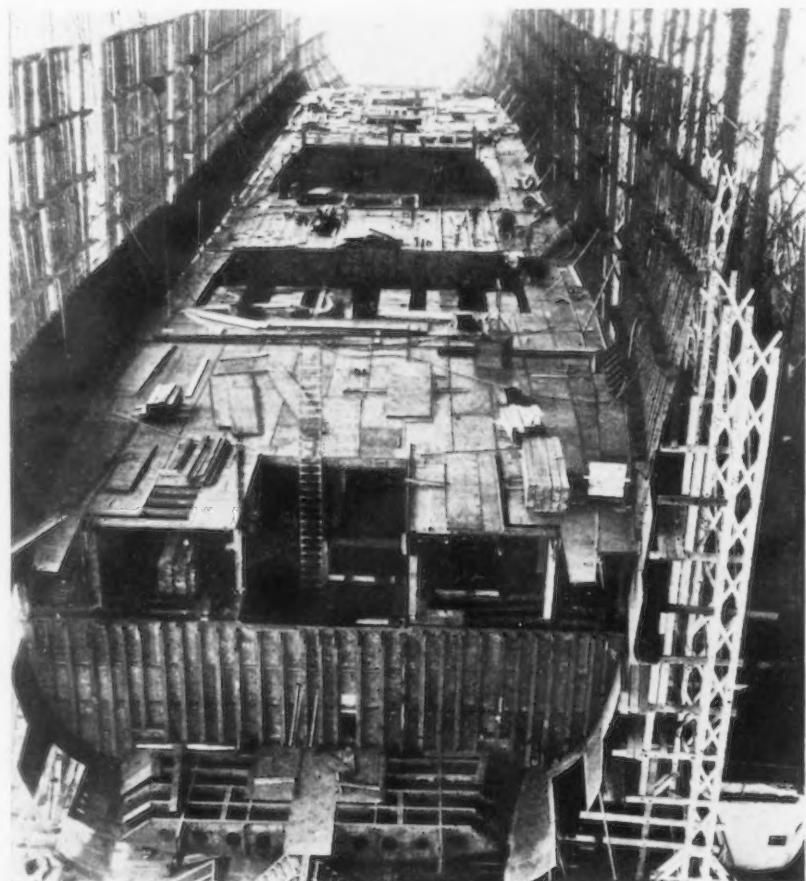
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Roller-Smith Co., 233 Broadway, New York, manufacturer of electrical measuring instruments, indicating and graphic, air and oil circuit breakers, relays and control panels, has appointed the Commercial Engineering Co., 1800 E Street, N.W., Washington, as its sales agent in the District of Columbia.

LARGEST AMERICAN-BUILT LINER TO BE LAUNCHED IN DECEMBER

WORK is progressing rapidly at the plant of the New York Shipbuilding Co., Camden, N. J., on the first of the 30,000-ton trans-Atlantic liners, largest ever to be built in this country. This ship will be launched in December and will enter the trans-Atlantic service of the United States Lines next May. The sister ship will go into service some time later.

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Steel Treathers' Group Meeting in Philadelphia Well Attended

Pipe Making By Centrifugal Process Discussed—Visit Paid to Naval Factories



A GROUP meeting of five chapters of the American Society for Steel Treating was held in Philadelphia May 15. The Philadelphia chapter was host to the New York, Lehigh Valley (Pa.), New Jersey and York (Pa.) organizations. This was the third joint meeting of this character. In May, 1929, the Lehigh Valley chapter was host to the Philadelphia and New York chapters at Bethlehem, Pa. In May, 1930, the New York chapter, assisted by the New Jersey steel treaters, entertained the Lehigh Valley and Philadelphia chapters in Newark, N. J.

More than 500 men were registered, some from other chapters than those directly concerned. Three buses brought nearly 70 from the New Jersey chapter and over 50 came by bus from the York district, while many drove or came by trains from other localities.

Pipe Making by Centrifugal Process

After registration at the Penn Athletic Club, the crowd assembled in the auditorium of the club for the technical session. The feature of this was a paper on the "Centrifugal Processes of Pipe Making," by Dr. F. C. Langenberg and S. B. Clark of the United States Pipe & Foundry Co., Burlington, N. J.

The main part of the subject was presented by Mr. Clark, who has for several years made a special study of the De Lavaud process used by his company and who has been closely identified with its development and perfection in recent years. The substance of the paper was published in *THE IRON AGE* April 30.

Mr. Clark presented the latest developments by means of slides on the screen. In discussing the production of pipe by this process, he made the statement that in 1930 something over 400,000 tons of pipe of various sizes up to 24-in. diameter was made in all countries, with about 50 per cent of this total credited to the United States.

Dr. Langenberg, director of research of the pipe company, supplemented Mr. Clark's address with some interesting comment. He referred to the various methods of casting metals by the centrifugal process and to

the vitally different problems involved. He cited the marked difference between the pipe process for iron and the method now in use at the Watertown Arsenal, Watertown, Mass., for centrifugally casting alloy steel guns 15 ft. long with a 3-in. bore. Three of these are being cast each day, comparing with 40 pipe per hr. at Burlington and other plants of his company.

Problems in Annealing Pipe

As to the annealing of cast iron pipe, Dr. Langenberg referred to statements often heard that very little gray iron is annealed. To controvert this, he cited the fact that over 200,000 tons of centrifugal pipe is heat treated each year in this country. But he pointed out that the chemical analysis of gray iron is no guide to the temperatures to be used, that the problem is not easy because of the complicated reactions which take place. The fact that the analysis may indicate a combined carbon content of around 0.10 per cent or higher, reaching at times 1.25 per cent, renders its critical point unknown.

Asked as to whether it is feasible to centrifugally cast cylinders and then slot them and roll them into plate or sheets, Dr. Langenberg said that, in the present established processes for making these products, recoveries are so high that there would be no advantage in the proposed method. This also applies to centrifugally cast slabs, he said.

In reply to a query as to the relative physical properties of forged and centrifugally cast steel, Dr. Langenberg asserted that, for a tangential bar, the results from the centrifugal metal are superior to the forged.

As further testimony on the subject of centrifugally cast steel, W. J. Jeffries, formerly with the Babcock & Wilcox Co., said that over 300 types of castings of rustless steel (18 and 8) have been successfully made by the centrifugal method and that steel pipe has been made in a machine of a somewhat different type than the one under discussion.

Referring to the steel mold for the De Lavaud machine, Dr. Langenberg said that a chrome-molybdenum alloy steel in the shape of a hollow forg-

ing is now used and that experiments on other alloy steels are in progress.

Luncheon Given by a Local Company

A complimentary luncheon followed the technical session. This was furnished by the Philadelphia Electric Co. At the close of the luncheon, the large assemblage was addressed briefly by George Whitwell, vice-president in charge of sales of the company.

It is the custom at these group meetings to make plant visitations a feature of the afternoon. In about 10 buses, with police escort, the members were taken to the Philadelphia Navy Yard, where guides conducted the party through the Naval Aircraft Factory, the forge and machine shops, the repair docks and the aviation fields. The battleship *New Mexico*, now being modernized, was visited.

Returning to the Penn Athletic Club, a dinner was served to about 400. The chief speaker was Gabriel Heatter of Edgar T. Ward's Sons Co., New York, editor of *The Shaft*, who delivered an excellent address on "The Road Back," with special reference to present economic conditions. Following this, the mayor of Philadelphia, Harry Mackay, brought the day's events to a close with appropriate words of welcome.

All the national officers and the board of directors except one were present. They had held a board meeting on the previous day. The Philadelphia chapter and its various committees were unanimously voted an expression of admiration and gratitude for a most successful group meeting.

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Form Company to Sell Ramet Hard Alloy

The United States and Canadian rights in the Ramet hard cutting alloy developed by the Fansteel Products Co., Inc., North Chicago, have been taken over by the Ramet Corp. of America, also of North Chicago, a subsidiary of the Fansteel company. Officers of the new company are: President, J. M. Troxel; vice-president and general manager, C. E. Stryker; and secretary and treasurer, E. F. Radke.

In addition to concentrating on the manufacture and sale of Ramet, the subsidiary corporation will make arrangements with tool and die makers for supplying finished tools and dies to users of this material. It also has an exclusive agreement with the parent company covering the supply of raw materials, as well as use of the Fansteel laboratories for research. The properties and uses of Ramet, a tantalum-carbide hard alloy for cutting tools, wire drawing and extrusion dies and other applications, were outlined in *THE IRON AGE* of Feb. 26, page 715.



May Automobile Output Expected to Total About 370,000 Units

DETROIT, May 18.

MAINTENANCE of automobile manufacturing operations at the recent relatively high rate gives added assurance that May will surpass April, with a total of at least 370,000 units. With June estimated at 325,000 cars and trucks, it seems safe to predict that second quarter production will run somewhat over the million mark against 1,261,000 units in the same period of 1930. This would be a better showing than the industry made in the first quarter compared with last year's performance.

Steel bookings from the automobile trade the past week were the leanest in several months. Although this fact is not thought to have much significance so far as most of the car makers are concerned, it reflects the downward trend of buying on the part of the largest producer of automobiles. Steel mills are looking with concern on the comparatively meager June purchases by this company. It is true that earlier in the year it considerably over-bought its requirements, with the result that its steel releases for the past two months have been about half of what it really needed for current operations. However, the bank of steel which it apparently built up through miscalculation or overestimation of its production is not inexhaustible, and, if its output is to continue at a reasonably satisfactory level in June, it surely must buy more steel.

Rather than showing signs of slowing down as summer approaches, the Chevrolet Motor Co. seems to be planning on maintenance of present activities through June and possibly for a longer time. Despite heavy assemblies in the last two months, it is asserted that there is actually a shortage among dealers of certain types of

Second quarter motor car output estimated at more than 1,000,000 cars, compared with 1,261,000 units last year. This would be a better showing compared with 1930 than in the first quarter.

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General Motors dealers sold more cars to users in April than factories sold to dealers, showing how closely production and sales are being synchronized. General Motors' sales to dealers last month surpassed those of April, 1930.

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Thirty-one Michigan automobile companies employed 184,111 men in April, compared with 181,952 in March. Weekly individual income of automobile worker last month was \$29.88.

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Hudson-Essex is offering free wheeling as optional equipment. Oakland-Pontiac in April had the biggest month since August, 1929. The new Packard is expected soon.

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cars, especially the de luxe and convertible models. The company's new bumper plant is just getting into operation and the past week announcement was made of plans to add 50 per cent to the capacity of the Saginaw malleable foundry division. This expansion program is to be completed in three or four months, at which time much of the General Motors malleable castings work now

being done outside will be brought into the Saginaw foundry.

Production Not Excessive

THERE has been some speculation as to whether recent high output of the industry is justified by retail sales demand. In other words, some skeptics think that the country's purchasing power is so crippled that the motoring public cannot absorb the cars turned out in recent weeks. In reply it can be said that the industry is holding rigidly to the policy of producing only what its dealers can sell. The overproduction of 1929 and the early months of 1930 is still too recent, in view of its consequences, to instill in any manufacturer the desire to make more cars than its retail outlets need. The close adjustment of production to sales is best illustrated in the case of General Motors, which sold 132,629 cars to dealers in April, while dealers in turn sold 135,663 cars to users. It is surprising that General Motors' sales to dealers last month surpassed by a narrow margin those in April, 1930.

Statistics for the industry in Michigan, compiled by the State department of labor and industry, show that in April 31 automobile manufacturers employed 184,111 men, compared with 181,952 in March. The aggregate weekly payroll last month was \$5,501,333, contrasted with \$5,275,324 the previous month, an increase in the weekly individual income from \$28.88 to \$29.88.

New Models Introduced

THE new Chrysler eight de luxe models, announced publicly on Saturday, have two high speeds, one for city driving and another for the open road. It is reported that changes and additions in some of the Chrysler-made cars will be ready

shortly. Chrysler is said to be going along at a pace of about 30,000 cars a month, although there is a possibility of a slight letdown in June.

Hudson-Essex has announced free wheeling as optional equipment on all of its models, thus making Essex the lowest-priced car with free wheeling available. Two other makers are understood to be preparing for the adoption of free wheeling. Marmon has made it optional on its various lines. It is freely predicted that practically all companies, with the exception of General Motors, will have some form of free wheeling before the year is out. The obstacle which is said to stand in General Motors' path is the royalties which must be paid on free wheeling to the Free Wheeling Patents Corp. Aside from Chevrolet, all of the General Motors cars now have synchro-mesh transmissions.

Just when the new Packard will be revealed is not definitely known, but it should be before midsummer. There has been a widespread belief that the new car will be of conservative design, but the latest information points to some radical changes. However, it is thought that the fundamental construction which makes a Packard recognizable as such will be retained. Nash also is reported to be preparing new models for early introduction.

Oakland-Pontiac Doing Well

OAKLAND - PONTIAC had the biggest month in April since August, 1929, producing 14,188 cars. On May 4 the factory had on hand

orders for 13,110 cars for May shipment and an output this month of at least 15,000 cars seems assured. The biggest pickup in retail sales has been along the Atlantic Seaboard. Studebaker is doing well, with about 7500 cars scheduled for May; Auburn is continuing to turn out as many cars as its plants at Connersville and Auburn can make.

One large pig iron house states that shipments this month are running 15 per cent ahead of those of April. The most interesting aspect of the situation is that the gain is not principally from the automobile industry, but from foundries making castings for electric refrigerator, radiator and stove manufacturers. A considerable tonnage can be classed as miscellaneous, originating in a variety of manufacturing lines. The first water shipment of pig iron this season from a Detroit furnace to a Muskegon, Mich., user will leave this week. However, all iron destined for the Chevrolet foundry at Saginaw is moving by water from Buffalo. There has been an encouraging upturn in foundry production in the Muskegon district recently, the two largest plants there having increased their melts.

The first few hundred of the new Reo Flying Clouds, soon to be publicly announced, have been shipped, and initial showings will be made by some dealers within a week. More than 1000 of the new models will have been produced by the end of May and a similar number of the new 1½-ton trucks will have been shipped. June will see all new models in full production, with

a total output in that month estimated at 3000 cars. This will make June one of the largest months in recent Reo history.

There is a feeling on the part of some steel men that the wire wheel for automobiles is here to stay. There is no denying its ascendancy at the moment, but in the automotive industry, with its almost constantly changing designs, it is dangerous to assert that anything is permanent. One observer close to the industry predicts that the rim and spokes of wire wheels will some day be made of rustless steel. However, that day is not near at hand, if one may judge by the recent experience of a steel sales executive. He asked a wheel company to give him a price on five rustless steel wire wheels for a quality car; the quotation was \$150 each, or a total cost equal to a car in the lower range of the medium-price bracket.

The full effect of lower railroad freight rates on finished automobiles will not be known for perhaps six months. Factories which have been shipping a considerable percentage of cars by the "driveaway" method cannot be expected to make an overnight change, although one plant actually has done that. Except for cars to be delivered within a short radius of the assembly plant, all finished automobiles are now shipped to dealers and distributors by rail. The benefits from lower rates will not be passed along to consumers until cars shipped to dealers prior to the change-over have been sold. It is said that the largest motor car company, which started last year to put into effect a complete "truck-away" system, has abandoned this scheme.

Chrysler has adopted cast iron brake drums for its new de luxe series of eight cylinder cars. It is the second automobile manufacturer to turn from light rolled steel to cast iron, Cadillac having made this change recently. The Chrysler brakes are made by the Holley Permanent Mold Division of Holley Carburetor Co.

The hub of the automobile city, Detroit, as seen from the roof of the Penobscot Building, the city's tallest structure.



General Motors to Expand Its Malleable Foundry

Saginaw Malleable Iron Co., Saginaw, Mich., division of General Motors Corp., has let contracts for construction work which will increase its capacity 50 per cent and make it the largest malleable iron foundry in the world. The expansion will enable General Motors to make most of its own malleable castings, which heretofore have been purchased from outside sources.

Truscon Steel Co., Foreign Trade Division, has removed its offices to 155 Forty-fourth Street, New York.

Push-Bench Process for Making Seamless Tubes

American rights to the modernized Ehrhart or push-bench method of producing seamless tubes have been acquired by the Aetna-Standard Engineering Co., Youngstown, Ohio. After making a complete and thorough investigation of the process, and having arrived at an understanding of the various merits and advantages embodied in it, the Aetna-Standard organization has brought about an arrangement with a leading English engineering and manufacturing organization which has specialized in and developed this type of tube mill equipment.

Considerable interest has been shown by American tube makers in this push-bench method, which is being used with success in England, Germany, Poland and South Africa. A Canadian installation is in course of erection and will be placed in operation during the coming summer. Another unit is being constructed for a prominent American tube maker and will be placed in operation at a later date.

The push-bench method will produce seamless tubes from Bessemer or open-hearth steel with equal facility. And it is stated that no difficulties are experienced in making alloy or stainless steel tubes, although the power consumption is slightly higher. The operations of the process, briefly, are as follows:

1. Square billets are heated in a continuous-type furnace.
2. The heated, square billets are placed in a vertical press and punched into a round, bottle or thimble-shaped billet. This operation is said to have a beneficial effect on the steel and may be classed as a forging operation in which the material undergoes improvement.
3. The round, bottle or thimble-shaped billet is then placed on the end of a mandrel and pushed through a series of dies or rings, in which reductions are successively taken until the required diameter is obtained.
4. The stub on the mandrel bar is then reeled. This operation cross-rolls the tube and gives it a highly finished surface, and at the same time loosens the tube on the mandrel bar.
5. The mandrel bar is extracted by a chain-driven bench, the tube being ejected and the mandrel bar returned to the mandrel handling device.
6. The tube may then be sized or reduced as may be required, and progresses through the ordinary finishing into a final product.

Acquisition of the American rights to this process permits the Aetna-Standard company to offer to tube manufacturers the combined experience of the English company as to

design, disposition, plant layout and operation of push-bench equipment. This is in addition to its own experience in the design, manufacture and layout of plant equipment of the automatic or Stiefel process.

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Newton Steel Co. May Make Tin Plate

The Newton Steel Co., Youngstown, Ohio, is concentrating production of full finished sheet steel at its Monroe, Mich., plant because of lower costs there. President Edward F. Clark states that the company is considering plans for the conversion of its Newton Falls property in Ohio into a tin mill plant at an approximate cost of \$1,000,000. Engineering studies and surveys are now being made in this connection. Mr. Clark and John H. Fitch, vice-president of the company, are both familiar with the tin plate industry. The former first became connected with the steel industry as president of the Liberty Steel Co., a tin plate property which is now a part of the plant of the Republic Steel Corp., located at Leavittsburg, Ohio.

Shipments of finished steel are being made from Newton's Monroe plant by motor truck to properties of the larger automobile companies in Michigan and Toledo. A dock is now being built which will permit the shipment of sheet bars from Cleveland by water.

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New Galvanized Sheet Extras Announced

New differentials for galvanized sheets have been announced by the American Rolling Mill Co., Middletown, Ohio, under the plan of reclassification of sheet steel products. No. 24 gage remains the base. On the lighter sheets, the extras have been increased in one instance and decreased in another; No. 29 gage takes an extra of 75c. per 100 lb. instead of 70c., while the decrease is on No. 25 gage, with 15c. to be added now against 25c. heretofore. Extras on Nos. 26, 27 and 28 gages are unchanged.

On the heavier gages, which are sold below base, the deductions have been reduced in a number of instances. On Nos. 11, 13, 15, 18 and 22 the deductions are 5c. per 100 less than formerly, while on Nos. 14, 16 and 23 the deductions are 10c. per 100 lb. less. The greatest change is on No. 17 gage, on which the deduction will be 35c. per 100 lb. against 50c. formerly.

Price "Freezing" Opposed As a War Policy

WASHINGTON, May 19.—"Freezing" of prices upon the outbreak of war is not contemplated in the mobilization plans of the War Department, the War Policies Commission was told by Gen. Douglas MacArthur, Chief of Staff, at a hearing last Wednesday. On the day following this process of "freezing" was advocated before the commission by former Assistant Secretary of War Benedict Crowell. General MacArthur said that the plan of freezing prices, suggested by Bernard M. Baruch, who was chairman of the War Industries Board, was opposed by the War Department because history showed this plan had been tried by other governments unsuccessfully, and would cause injustice and create antagonism. Mr. Crowell said he did not see how it was possible to improve upon the Baruch plan for taking the profit out of war by freezing prices.

General MacArthur said the plans of the War Department call for the equalization of the human burdens of war as far as possible. The economic burdens, he said, must be equalized through (a) systematic registration of wealth * * * and tax legislation; (b) orderly and economic procurement by the Government itself; (c) strong and intelligent leadership; (d) application of governmental control to meet requirements of the specific situation and to prevent any profiteering at the national expense, and (e) prompt resumption of normal peace conditions upon the termination of war.

General MacArthur also said the War Department is opposed to conscription of labor. Even if tolerated by the public at large, which was doubted, General MacArthur said the workers would be so resentful that they would not lend their best efforts to the production of needed supplies.

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Baldwin Locomotive Buys Cramp-Morris Plants

The Baldwin Locomotive Works, Eddystone, Pa., has acquired subsidiary companies of Cramp-Morris Industrials, Inc., a holding corporation operating I. P. Morris & De La Vergne, Inc., the De La Vergne Engine Co., Cramp Brass & Iron Foundries Co., all of Philadelphia; Federal Steel Foundry Co., Chester, Pa., and the Pelton Water Wheel Co., San Francisco.

The Federal Steel Foundry Co. specializes in steel castings, the Cramp Brass & Iron Foundries Co. operates iron and brass foundries, and the Pelton Water Wheel Co. constructs hydraulic turbine machinery and valves.

In acquiring these companies, the Baldwin Locomotive Works has increased its capacity for building Diesel motors required for the new type Diesel-electric locomotives.

PERSONALS

EDWARD C. BULLARD was the guest of honor at a dinner at the Hotel Stratfield, Bridgeport, Conn., Thursday evening, May 7, to mark the occasion of his appointment as general manager of the Bullard Co., Bridgeport, to succeed his uncle, the late Stanley Hale Bullard. Edward C. Bullard was recently elected a vice-president of the company. The new vice-president and general manager was presented with a set of golf clubs and a miniature model of the Bullard Mult-Au-Matic. E. P. BULLARD, president of the company, the Mayor of Bridgeport and others prominent in the city's industrial life made brief remarks. At a special table sat 23 men of the "Old Timers" group, whose length of service with the company averaged 32 years each.

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W. E. OELSCHLAAGER, formerly of the sales organization of the Chicago office of Rogers Brown & Crocker Brothers, has become identified with Domhoff & Joyce Co., dealer in coke. His headquarters will be at Chicago and he will cover Wisconsin, Iowa and Minnesota.

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BURROWS SLOAN has been elected chairman of the board of the General Refractories Co., Philadelphia, and JOHN R. SPROUL has been made president. E. A. MCKELVY has become vice-president and ROGER A. HITCHINS, secretary-treasurer.

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A. J. COUSE has been appointed Chicago district manager for the Edgewater Steel Co., Pittsburgh, with headquarters at 1329 Peoples Gas Building.

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E. H. MEBS, heretofore metallurgist at the Watertown Arsenal, has become chief metallurgist of the Ohio Steel Foundry Co., Lima, Ohio. Mr. Mebs was graduated as a metallurgical engineer from Ohio State University in 1921 and was identified with the Wheeling Mold & Foundry Co. for eight years, the last two as assistant general superintendent.

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E. C. BONISTALL, formerly of the engineering department of the Pennsylvania Railroad at Altoona, Pa., has been placed in charge of the Cincinnati district office of the Rollway Bearing Co., Inc., Syracuse, N. Y.

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OTTO LUTHERER, who has been research engineer at the laboratory of the American Gas Association, has been appointed chief engineer of the North American Mfg. Co., Cleveland, maker of turbo-blowers and combustion equipment.



EDWARD C. BULLARD



A. L. CROMLISH



ROBERT F. MEHL

ALBERT L. CROMLISH, since 1920 superintendent of the Farrell, Pa., works, Carnegie Steel Co., has been appointed general superintendent of the company's Duquesne, Pa., plant, succeeding SAMUEL G. WORTON, who has resigned. Mr. Cromlish was born at Wilkesburg, Pa., and attended the East Liberty Academy, Pittsburgh, and Pennsylvania State College, having been graduated from the latter institution. He entered the employ of the Shenango Valley Steel Co., New Castle, Pa., in 1897, as a chemist, and two years later went with the Carnegie Steel Co. as chemist at its Niles, Ohio, furnace. He later went to the company's New Castle, Pa., works as chief chemist, and in 1904 was made assistant superintendent of blast furnaces at the Carnegie company's Farrell plant. In 1908 he became superintendent of the company's blast furnaces at Donora, Pa., the Neville Island and Edith stacks at Pittsburgh, and the blast furnaces at Farrell, holding that position until his appointment as general superintendent of the Farrell works 11 years ago.

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STANLEY P. WATKINS, formerly metallurgist for the Wrought Iron Research Association, Pittsburgh, has become identified with the research staff of the Rustless Iron Corp. of America, Baltimore.

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E. A. RYKENBOER, general superintendent of the Niagara Falls, N. Y., plant of the Roessler & Hasslacher Chemical Co., and M. J. BROWN, assistant vice-president, have been elected vice-presidents of the company.

R. F. MEHL, since September, 1927, superintendent of the division of physical metallurgy of the Naval Research Laboratory, has been appointed, effective Sept. 1, assistant director of research of the American Rolling Mill Co., Middletown, Ohio. He will be in charge of the physical science department. Mr. Mehl received his B.S. degree at Franklin and Marshall College in 1919 and remained in university work at Princeton and at Juniata College, where he was head of the department of chemistry, until 1925. For the next two years he was a research fellow at Harvard University.

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E. L. WATSON has retired from active service as president and general manager of the American Furnace & Foundry Co. and also as president and general manager of the American Boiler & Foundry Co., both of Milan, Mich. Mr. Watson will retain his place as a director on the board of both companies. He has not announced his plans for the future other than a lengthy rest from manufacturing duties.

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J. H. MORRIS has been elected secretary of the Inland Steel Co., Chicago, succeeding W. D. TRUESDALE, who has served as secretary and treasurer. Mr. Truesdale remains as treasurer.

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WARREN H. SAPP, general manager of Armour & Co., Chicago, has been elected president of the Illinois Manufacturers' Costs Association. GEORGE L. SEE, Western Electric Co., has been elected vice-president. Among the new directors are: H. J. DAVISON,

Standard Forgings Co.; O. E. MOUNT, American Steel Foundries; GEORGE A. NEESHAM, Wyckoff Drawn Steel Co.; J. E. SCHWANER, Chicago Belting Co.; L. J. STEWART, Western Clock Co.; B. R. WELLS, Fairbanks, Morse & Co.; H. G. HOOK, Stewart-Warner Corp.; H. A. KRILL, Western Wheeled Scraper Co.; A. L. WANNER, Belden Mfg. Co., and H. A. TRACY, Delta-Star Electric Co.

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C. A. PUGH, vice-president, Aetna-Standard Engineering Co., Youngstown, has returned from a two months' trip to Europe, where he visited England, Germany, France, Belgium and The Netherlands.

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GEORGE E. ROSE, who is general superintendent of the Wisconsin Steel Co., was recently fêted at the Palmer House, Chicago, in honor of his 25 years of service with the company. Among those who paid tribute to Mr. Rose was ALEXANDER LEGGE, ex-head of the farm board and president of the International Harvester Co.

♦ ♦ ♦

J. R. ADAMS, superintendent of the special products department of the Midvale Co., Nicetown, Pa., was the guest of the Hartford, Conn., chapter of the American Society for Steel Treating last week. He discussed large press and hammer forgings.

♦ ♦ ♦

C. H. BUTTS has been appointed vice-president in charge of operations of the Newton Steel Co., Youngstown, succeeding C. B. POLLOCK, who has resigned. Mr. Butts has been connected with the company's operating division. R. L. RITZIE, manager of the company's plant at Newton Falls, Ohio, has been named general manager of the Monroe, Mich., and Ohio properties. R. M. LANNING has resigned as manager of the Monroe plant.

♦ ♦ ♦

CHARLES H. DAVIS, assistant metallurgist, American Brass Co., Waterbury, Conn., is scheduled to speak on the "Relation of Structure to Physical Properties of Some Non-ferrous Alloys" at the May 22 meeting of the New Haven chapter of the American Society for Steel Treating, to be held at the University Club, Bridgeport, Conn.

♦ ♦ ♦

C. L. FERGUSON has been appointed general superintendent of the Mahoning Valley Steel Co., Niles, Ohio, effective May 31, succeeding Harry C. Davis, who has resigned and who has been superintendent since April, 1922. Mr. Ferguson has been superintendent of the Falcon plant at Niles of the Empire Steel Corp., Mansfield. DAVID SMITH, hot mill superintendent of the Falcon works, is acting as director of operations at Falcon.

OBITUARY



E. A. S. CLARKE

E. A. S. CLARKE, secretary of the American Iron and Steel Institute, died of pneumonia at his home at Rumson, N. J., on May 15, after a week's illness. He was born at Ottawa, Ont., Jan. 1, 1862, and, after a preliminary schooling in Philadelphia and abroad, went to Harvard University, from which he was graduated in 1884, receiving the degree of Bachelor of Arts. In that year, he entered the employ of the Spang Steel & Iron Co., Sharpsburg, near Pittsburgh, working in the laboratory under Robert Forsythe, and continued until June, 1885. He then went to the Union Steel Co., Chicago, in a similar capacity with Mr. Forsythe. Mr. Clarke became assistant superintendent of the works in 1890. When the Union Steel Co. became a part of the Illinois Steel Co., he was made assistant general superintendent of the South works, having become general superintendent in 1895 and general manager of the company four years later. In 1900, he resigned to become general manager of manufacturing of the Deering Harvester Co. and about three years later entered the service of the International Harvester Co., where he organized and built up the Wisconsin Steel Co., a subsidiary company of the Harvester company. In December, 1904, he became president of the Lackawanna Steel Co.

During the time of his presidency, the Lackawanna company was radically changed and improved. Two new blast furnaces were built and the product was changed from Bessemer to open-hearth steel. Mr. Clarke resigned as president of the Lackawanna company on Jan. 1, 1919, to accept the presidency of the Consolidated Steel Co., an export company formed by leading independent manufacturers of steel. When this com-

pany was dissolved in December, 1922, Mr. Clarke was elected secretary of the American Iron and Steel Institute. He had been an active member since its organization and throughout the period of the war was secretary of its most important committee, that on steel and steel products, which co-operated with the Government in price fixing. His duties as secretary of this committee were extremely arduous. He worked with untiring energy and with such success as to receive the highest commendation from officials of the Government and manufacturers of iron and steel products.

♦ ♦ ♦

VICTOR E. EDWARDS, inventor of the flying shear and other important improvements in continuous rolling mill practice, died at his home in West Boylston, Mass., May 16, following a very long illness. Until three years ago he was a vice-president, a director and the chief engineer of the Morgan Construction Co., Worcester, Mass., with which he had been associated from young manhood. He was 68 years old. He was a pioneer in the development of the continuous rolling mill and played a most conspicuous part in its evolution to the highly efficient automatic mill of today. He was still in his twenties when he conceived the idea upon which he based the design of the first flying shear. Rolling mill designers had been seeking to overcome the hitherto insurmountable obstacle of inertia in the heavy mechanism. The Edwards method solved the problem, and in 1892 the Morgans built for the Jones & Laughlin Steel Corp. the first rolling mill successfully to operate with flying shears.

Many other inventions are recorded to Mr. Edwards' credit, comprising not only improvements in his shear, but to cooling tables, rolls and furnaces.

He was born at North Chelmsford, Mass., Sept. 4, 1862. He attended the village schools and was graduated from Worcester Polytechnic Institute in 1883. Before going to the Morgan Construction Co. he was connected as an engineer with the Merrimack Mfg. Co. and served as assistant chief engineer for the Washburn & Moen Mfg. Co., Worcester, and as assistant engineer for the Otis Steel Co.

He served in the World War as a major in the Ordnance Department and did much intensive research at the Alden Hydraulic Laboratory of Worcester Polytechnic Institute, particularly on the design of airplane propellers and on projectile shapes.

♦ ♦ ♦

CHARLES A. INGLE, of the National Forge & Ordnance Co., Irvine, Pa., died after a long illness at his home in Caledonia, N. Y., on May 8, aged 57 years.

Maladjustment of Prices Is Still Considerable

BY DR. LEWIS H. HANEY
DIRECTOR, NEW YORK UNIVERSITY BUREAU OF BUSINESS RESEARCH

THE commodity price trend is still downward. As of May 1, the Bradstreet index touched a new low level. For eight weeks a majority of basic commodities have shown declines. Moreover, the raw materials group continues to lead the decline, with steel scrap outstanding.

Statistics or no statistics, buying of commodities is better than selling and in this sense supplies are in excess of demand. Stocks of certain important commodities have ceased to decline, or have actually increased—as in the cases of copper and zinc.

As usual in cyclical movements, the average price of finished steel has been slow to conform. It is now further above its average relation with the general level of commodity prices than since the middle of 1921.

Watch for Upturn in Commodity Prices

One of the earliest signs of an approaching turn in the trend of general business will probably be a recovery in the average price of raw materials. When we find finished steel prices declining while Bradstreet's price index is rising, and steel scrap and pig iron are stabilizing, then we may look for the first signs of recovery. (For example, see 1921, 1924 and even 1927.)

Any precedent drawn from recent years appears to indicate the probability of a further decline in the average of finished steel prices, and one that may carry the monthly averages lower for three to six

successive months. What is there to deprive precedent of validity in this case? What is there to keep steel prices up?

(1) It may be said that the steel market has shown great resistance. But this was true in 1923.

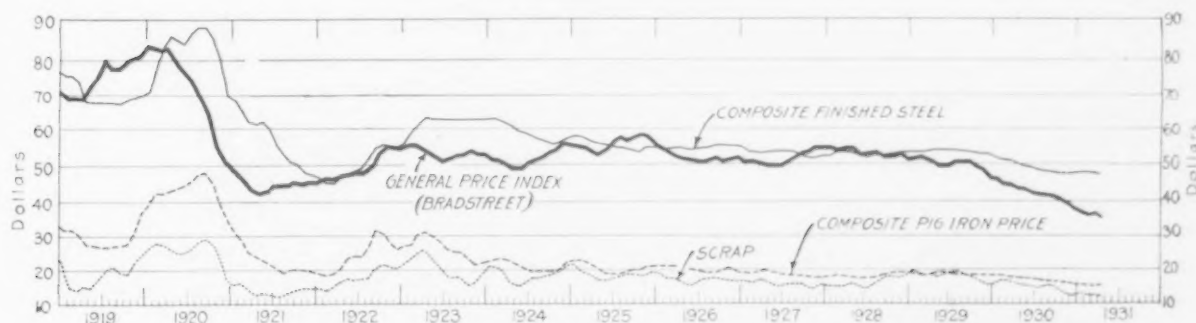
(2) Fear of labor troubles, which might be caused by the wage reductions necessitated by lower prices, may be mentioned. But if buyers will not take steel in sufficient quantities to permit profitable operation at present prices, and if unemployment results, will labor not prefer a reasonable reduction in wages?

Not All Products Are Out of Line

(3) It may be argued that sheet and wire prices are very low now. But this merely emphasizes maladjustments in the prices of different steel products.

(4) It is true that finished steel prices average low in comparison with such materials as coke and scrap. But it is a question whether we have yet seen the bottom of the scrap market, or even of the coke market.

(5) May the demand for steel not pick up soon enough to prevent a further reduction in prices? No early improvement in the quantity demanded is indicated by the activity in the chief consuming industries. And usually, when the *quantity* of steel demanded does begin to increase, the steel makers are glad to accept orders at lower *prices* in order to encourage volume and get reduced unit costs.



Spread between Bradstreet prices (adjusted) and finished steel opened up further in April.

(ESTABLISHED 1855)

The Trend in Car Loadings

IN the last four weeks there has been a slight upward trend in freight car loadings after allowance is made for average seasonal variation. The trend is by no means marked, but there is reasonable assurance that general business as measured by this important index has not lately been engaged in growing worse. Now is approximately the earliest time when such a statement could be made with any degree of confidence.

The opinion has been widely expressed that the period of business recession ended last December and studies now are naturally made to test the correctness of that view and, if it is correct, to observe whether any process of recovery has set in. Car loading reports being available for the first 18 weeks of this year, the period may be conveniently divided into three six-week periods. To allow for seasonal variation the five years 1924 to 1928 inclusive may be taken as standard. That series includes one year, 1927, with a poor ending, and one year, 1928, with a particularly good ending. It is undesirable to include either 1929 or 1930 in an average, as both were erratic years.

Compared with similar periods in 1924-8, this year's car loadings have shown the following decreases:

	Per Cent
First six weeks.....	22.2
Second six weeks.....	23.2
Third six weeks.....	20.5
Eighteen weeks through May 2.....	21.9

In the second six weeks loadings fell off a little and then they regained their loss and something additional.

Of course, car loadings are merely a total or composite representation of a wide range of activities and a carload of one material may mean much more business than a carload of another. Coal for domestic use is a disturbing factor as it is more a matter of weather, which is not the same each year, than of business conditions. To furnish some line on the details, a comparison may be made of the first 18 weeks of this year with the same period of 1929, which was record high: Total car loadings were off 23 per cent, miscellaneous car loadings were off 27 per cent and less-than-carload merchandise was off 15 per cent. Coal was 24 per cent off, just about the general average, while a smaller decrease was shown by grain and grain products and by livestock, and there were declines greater than the average in coke (36 per cent), forest products (48 per cent) and ore (64 per cent). This comparison perhaps furnishes some encouragement. So large a decrease in ore indicates liquidation of stocks and cannot be permanent.

The comparison just made by using six-week

periods this year serves as an index to general trade trends. As to the position of the railroads, now of such vital interest, other comparisons can be made. Car loadings in the whole of 1930 were off 13.1 per cent from 1929, which was not the record year, having been slightly under 1926 on account of slipping in its late months. Last year was off 10.4 per cent from the average of the five years prior to 1929. It was under all the seven years 1923 to 1929 inclusive. For a longer range view it is better to take revenue ton-miles for comparison. In those terms last year ran above 1916 and preceding years, and also above 1919, 1921 and 1922. It was the poorest of 14 years with those three exceptions.

Seeing the Light

IN its May letter on the business trend the National City Bank of New York has this on the response of bricklayers in and about New York City, not to any formal demand of employers but to the more imperative demand of continuing scarcity of jobs:

In the latter part of 1929 bricklayers in the metropolitan district of New York were receiving \$1.87½ an hour wage and laying an average of 250 to 300 face brick or 700 common brick per day. Now they are receiving \$1.92½ an hour, but laying 400 to 500 face brick and 1200 to 1400 common brick a day—an increase of approximately 80 per cent in efficiency. It is roughly estimated that the daily output of structural steel erectors has increased 20 per cent and the combined efficiency of all building trades by nearly that amount.

This attitude of workers in an important trade—and its extension to other trades—will do more to increase employment and bring in normal business than some hundreds of the articles, addresses and interviews that in the past year have theorized on causes and cures of the depression. Excessive production costs, wasteful production methods and extravagant living expenditure are all plainly recognizable now, as they were not at the time, in the contagious delusions of 1928 and 1929. Much of the trouble stored up then was due to the wide prevalence of the idea that high labor cost need cause no concern if only the worker spent his wage freely so as to maintain mass production on an ever increasing scale.

Just now there is much jumping at conclusions concerning cause and effect relations of various developments in the business situation. At the same time it is more than a coincidence that with the establishment of the new day's work of bricklayers in the metropolitan district there should come the

statement in the news columns of the Dow Service Daily Building Reports that common brick demand is 35 per cent greater than it was last year at this time, also that not since 1921 has common brick, still warm from the kiln, come into dealers' hands.

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Debunking

THE late Lord Melchett who visited us shortly before his death last year remarked in one of his addresses that there was need for more psychologists and fewer economists. Perhaps his meaning was that economists in their bewildering discussions and chartings of abstract ideas lose perception of the simple things of common sense. We become so snarled with controversy that the exhibition of common sense is sometimes characterized as debunking. A correspondent who has some reputation as a debunker writes us as follows:

There is a lot of work in this country that ought to be done. Materials are now so cheap that this would appear to be the time to do it, but labor is not cheap. I mean, of course, the labor that we require in the distribution and use of materials.

My credit is good, but I do not intend to use it in building houses on the terms that mechanics demand for themselves. I feel sore over some costly construction that I did in 1929.

I am a stockholder in several companies engaged in the production of materials. Every one of them has discontinued dividends. This cripples my ability to do things. I have to curtail my help.

My town makes employment for men in doing useless work, pays them more than the private rate, and takes it out of me (and others) in taxes. So we have less dividends and more taxes. Even before this the abstraction by the tax-gatherer was calamitous.

A good many populist exponents of the "peepul" decry the evil of profit in business. We have arrived at a no-profit stage, and I hope they see how it works, but I doubt if they do.

The profitless production of commodities does not make for prosperity. We should be better fixed, all of us, if we had cheaper labor and dearer commodities, for then the hired men could get full-time work and the stockholders could get some dividends, and we should all feel a confidence and willingness to make use of our credit.

Speaking of credit, there are theorists who deplore the concentration and immobilization of gold in this country. I suppose there is no way we could redistribute it except by lending it, which would mean that foreign loans would have to be floated in this country. We lost a lot of money by the Russian repudiation and some other experiences, and as we observe the rife of socialism, revolutions and other hell-raising abroad I don't think we are keen about lending more money. This is the reason why many foreign issues among us sell on a 10 per cent basis.

I operate a poultry farm in New England, the investment in which is far in excess of that of the average farm in the United States. Incidentally the annual value of the product of the poultry farms is in excess of wheat, and that of the dairy farms, is twice as much. In poultry raising the largest element of expense is feed. We get the benefit of the reduction in the prices for wheat, corn and oats, but the milling, transportation and distribution charges that are put on top of them remain unchanged; so we lose money on the production of eggs and broilers, although our methods are efficient. We may have to sacrifice our principal, but we shall at least keep

our land and our tools, and if things come to the worst we can live off the land.

In this respect the six million farmers of this country are in the safest position. If the urban workers, who do not raise food and fuel and fiber, see fit to work themselves, or rather unwork themselves, into destitution, that is their own affair, but there ought to be someone to warn them what they are doing, which probably they do not realize

It is evident that this correspondent does not take any stock in theories of business cycles, over-production, insufficiency of gold supply and all the rest of the controversial arguments of economists, but looks upon the present depression as being largely of our own making. There is too much socialism abroad and too much paternalism here. This destroys confidence and cripples credit. Labor is a poor salesman of itself, and thus unemploys itself and starts a vicious spiral. Undoubtedly there is much truth in these thoughts and there is clearly an increasing appreciation of it. There is more and more talk of the necessity for bringing commodity prices and labor prices more nearly into balance. There has been already an enormous deflation of labor but it has been in the wrong place, i. e., on the side of production rather than on that of distribution.

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Finished Steel Demand in 1930

LAST year was an off year in steel demand, following a record year, and naturally enough there were widely different losses in the respective finished steel items. These divergences are worth studying, as some of them are related to general principles. It is convenient for the study to arrange the finished products in the order of their losses from 1929 to 1930, as is done below, the table being split at the middle to show the average loss.

Percentage Decreases, 1929 to 1930

Seamless tubing	8.4
Tin plate	10.4
Strips	22.4
Rods	25.0
Pipe mill products.....	25.6
Structural shapes	26.5
Wire nails	27.0
Plates	27.1
<hr/>	
All products	28.1
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Rails	31.2
Sheets	33.2
Merchant bars	36.0
Forging blooms and billets.....	42.3
Tin mill specialties.....	56.3
Hoops	60.9
Cotton ties and other bands.....	88.0

Seamless tubing makes the best showing, with only 8.4 per cent loss. There was a 4.5 per cent increase in seamless "oil country goods," including tubing for pipe lines, while there was a 38.4 per cent loss in mechanical tubing, a smaller item in tonnage but important in its way, as it is chiefly very light material. Tin plate naturally comes high in the list, for it always does relatively well in a depression, being a

material of every-day consumption, involving quite largely what may be called necessities.

The 22.4 per cent loss in strips compares with a 33.2 per cent loss in sheets. Strip production has been gaining more rapidly than sheets in percentage, but not so rapidly in tonnage. From 1920 to 1929 strips gained 1,916,269 tons and sheets 2,367,597 tons, but the strip increase was 327 per cent and the sheet increase 82 per cent.

Rods take a very fair place in the table, with only 25 per cent decrease from 1929 to 1930, but the 1929 production had been far from a record, and the same is true of nails, a rod product.

The table has an item "pipe mill products" with the relatively small decrease of 25.6 per cent. In the official statistics the term "wrought pipe" is used, including line pipe made by pipe mills, but apparently all or a large part of electric-weld pipe is excluded, and thus no close measure is afforded of the commercial product used for pipe lines. Ordinary standard pipe, black and galvanized, decreased only 21 per cent, but the 1929 production had been exceeded by four of the preceding years.

Rails decreased more than finished steel in general, but the calendar year showing would have been different had not so many rails been rolled late in 1929 on anticipatory specifications.

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Cost Control and Wage Incentives

(Concluded from page 1663)

superintendent and he holds this card until the parts are ready for final assembly. Then he sends the card to the finished stock room, and the various parts required in building the lathe are delivered to the final assembly department. This card usually goes back and forth between the finished stock room and assembly floor a number of times until all the parts needed are delivered as needed. All units for final as well as sub-assemblies are ordered by card number. When the machine is completely assembled, the final assembly card goes to the production department.

Every sub-assembly bears a unit number of two figures, as 1-2. The first number is constant and indicates a certain sub-assembly, such as a head stock, and the second number indicates the type or design of that sub-assembly. When a customer orders a repair part for a lathe of a certain serial number, the number of each unit is determined by referring to the original order, and the proper part number of each piece can be secured.

The material control sheets are filed in a series of bins in the production department, being arranged in order according to size and unit.

About 8000 active parts are used in building the various types of lathes. There are about 60 unit numbers representing sub-assemblies and 350 combinations of assembled units.

Finished stock is carried in steel bins bearing cards showing the blue print number, name and size

of part and bin number. All bar stock has the ends painted with a different color for each of the nine grades of steel used. A color chart hangs at the side of the steel storage racks for convenience in selecting stock.

Cost Work Done by Three Persons

Two men and a girl handle all the production control work and in addition do much of the cost work. This indicates that the system of control does not add a great deal to the overhead. Various advantages in the operation of the system have been found by the management. Inventories of rough stock and semi-finished parts are reduced by the method of control. Carrying of rough stock in storage has been largely eliminated. Obsolescence of certain types of machines or attachments previously resulted in an over supply of certain semi-finished parts. This also has been eliminated. A reduction in inventories has been accomplished by watching the stock closely and knowing what the demands are as is indicated by the material control records. Sales, assemblies and parts are tied up in the one sheet. Figuratively, this control sheet is a pulse on which the management keeps its finger. Delivery demands, it is claimed, are being met more promptly by the production control system. If sales pick up, manufacture of parts and assemblies is speeded up in the same ratio in order to keep a fair margin of finished parts ahead of sales.

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Tungsten Electroplating Now Possible

A METHOD has been developed for the plating of metallic tungsten from aqueous solutions, according to a paper presented at the fifty-ninth general meeting of the Electrochemical Society at Birmingham, April 23 to 25. The authors are Dr. Colin G. Fink, professor of electrochemistry at Columbia University, New York, and Frank L. Jones, industrial fellow, Mellon Institute, Pittsburgh.

The tungsten deposit, it is stated, is smooth, hard and coherent, having a high luster. Like chromium, the electro-deposited tungsten needs no polishing if the plated article is previously polished. Tungsten is desirable as a protective coating for other metals, because it has remarkable acid-resisting properties.

Several types of solutions have been investigated as to their usefulness as tungsten plating baths. Solutions of tungsten salts in organic solvents were found unsuitable for this purpose and aqueous solutions of an acid nature did not produce metal deposits that were satisfactory. Alkaline solutions containing alkaline tungstates were preferably used as plating baths. The authors state that the temperature, cathode current density, and hydrogen ion concentration of the solution must be controlled.

Alloys of tungsten and iron, and of tungsten and nickel, have been deposited electrically from similar solutions containing very small concentrations of the ions of these second metals. The authors also point out the usefulness of highly alkaline solutions as plating baths for the electrodeposition of other metals.



Steel Production Sags Further in a Dull Market

▲ ▲ ▲
INGOT Output Recedes to 45
Per Cent—Pipe Line Awards
Total 32,000 Tons—Auto-
motive Requirements Falling Off
—Decline in Scrap Prices
Checked
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THE iron and steel market is drifting and current developments throw little light on its course. Steel ingot production is unchanged in most centers, but has given further ground at Pittsburgh, causing the national average to decline from 47 per cent to 45 per cent of capacity. Steel Corporation operations, which have been conforming rather closely to the general trend, are estimated at a point or two above the rate for the entire industry.

Steel shipments are only fractionally lower than in April, but new business is sagging, particularly from the automobile industry. Construction activity is the only steel outlet promising early expansion. The week's awards of line pipe total 32,000 tons, but lettings of both pipe and fabricated structural steel have failed thus far to measure up to the large amount of inquiry that has come out for figures. New structural projects added to the pending list during the week total 52,500 tons; yet contracts actually placed, at only 16,000 tons, make an even poorer showing than a week ago, when they aggregated 16,500 tons.

THE tone of prices is still weak, although the diminishing size of orders is tending to relieve the pressure for concessions. Scrap prices are soft and here and there have given further ground, but show signs of approaching bottom. THE IRON AGE composite for heavy melting scrap is unchanged at \$9.83 a ton, following five weeks of uninterrupted decline. Billets, slabs and sheet bars are off \$1 a ton to \$29, Pittsburgh or Youngstown, and wire nails have receded \$2 a ton to \$1.80 a keg, Pittsburgh. Concessions of \$1 to \$2 a ton are reported on cold-rolled strip, galvanized sheets have been shaded \$1 a ton to 2.75c. a lb., Pittsburgh, and reinforcing bars are increasingly irregular in some centers.

PIPE line orders include 20,000 tons of 10-in. placed by the Sun Pipe Line Co. with the Jones & Laughlin Steel Corp., and 12,000 tons of 12 and 20-in. awarded by the Columbia Gas & Electric Co. to the National Tube Co. The Memphis Natural Gas Co. is in the market for 200 miles of 8 to 10-in., calling

for 16,000 tons of steel. Bids on the Hetch Hetchy pipe line, San Francisco, a project involving 35,000 tons of plates, will be opened May 20.

Barge construction in the Pittsburgh district is at a fair rate, with improvement in prospect. Barges on which figures are being taken call for 15,000 tons of plates. The railroad equipment industry is exceedingly quiet, with interest centered in an inquiry from the Northern Pacific for 500 underframes and superstructures for box cars, requiring 6000 tons of steel.

Road building is stimulating shipments of reinforcing bars, wire mesh and culverts. On the other hand, farm implement makers continue to scale down their operations, and tin plate output is still tapering, now averaging 70 per cent of capacity.

AUTOMOBILE production is being maintained at a rate that makes a May total of 370,000 cars virtually a certainty. However, a slackening of steel releases and uncertainty regarding the plans of a leading motor car manufacturer make the outlook for next month dubious. Nevertheless it is still believed that June output may reach 325,000 units.

APATHY rules in the pig iron and coke markets. Two blast furnaces in the Valleys have been banked, while a steel works stack has been put out at Pittsburgh and a merchant furnace has been blown out at Chicago. Foundry operations continue to decline in most districts, the outstanding exception being Michigan, where May shipments of pig iron are running 15 per cent ahead of those of last month. A Buffalo producer serving the Michigan trade is reported to be planning to bring in another furnace.

Connellsville furnace coke has declined from \$2.50 to \$2.40 a net ton and distress lots have sold at even lower prices. Beehive foundry coke has dipped in some cases to \$3, Connellsville, and \$3.25 is an increasingly common price on so-called standard brands.

THE IRON AGE composite prices for finished steel and pig iron are unchanged at 2.114c. a lb. and \$15.79 a gross ton respectively.

PITTSBURGH Steel Operations in Slow Decline—Future Developments Uncertain

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PITTSBURGH, May 19.—The steel industry continues to lack significant developments, and present conditions throw little or no light on its future course. Shipments this month are only fractionally lower than the April average, and any decline in releases is too small to be easily noticeable. On the other hand, operations continue to decline, and remain intermittent in many finishing departments.

Steel ingot production, reflecting curtailment among the smaller units as well as among the larger producers, is estimated this week at 40 to 45 per cent, with independent companies in this district scarcely maintaining a 35 per cent rate. In the Wheeling territory production is maintained largely because of the persistently high output of one producer.

Tin plate production is still contracting, although not at a pronounced rate. Sheet operations are also lower, with some companies apparently not willing to accept all the business offered them at present low price levels. Activity in line pipe promises an early improvement in pipe mill operations.

Line pipe awards are again the feature of the week's developments, a Pittsburgh producer having taken an order for 20,000 tons of 10-in. seamless material. Other small tonnages have been placed, and the outlook for further business is good.

Barge inquiries being figured by yards in this district also call for a substantial tonnage of plates, which may also offset the lower releases of railroad equipment builders, who have just about reached the end of their order books.

Structural steel awards in this district are very light, although Pittsburgh mills are still benefiting from substantial tonnages placed in other parts of the country. A highway bridge at Pittsburgh, on which bids will likely be asked next month, will require 5000 tons. Reinforcing bars are moving in fair volume, but prices are weak because of rail steel competition, and the anxiety of distributors to take business.

Shipments to the automobile industry have not reflected any substantial decline, but estimates of June output are not attempted by Pittsburgh companies.

Prices continue rather weak, but the character of current orders does not provide much test of the market. Wire nails are more freely available at 10c, a keg under recent minimum prices, and semi-finished steel is

Operations of steel-making plants and some finishing departments decline slightly.

* * *

Steel ingot output for district ranges from 40 to 45 per cent.

* * *

Line pipe awards, one of 20,000 tons, feature of new business.

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River barge building may offset lower releases of plates from railroad car builders.

* * *

Scrap market steadies, though showing no recovery.

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weaker. Producers of bars, plates and shapes are no longer trying to get more than 1.65c., Pittsburgh, except on mixed carload lots, but this figure seems to be fairly well maintained on current orders. Producers of sheet steel do not expect to make the new selling schedules, announced recently, entirely effective before the beginning of the third quarter. Talk of higher asking prices for hot-holed strip is still heard, and some companies hope to make these effective on third quarter tonnage. Cold-rolled strip is subject to considerable shading.

Scrap prices have been maintained in the last week on the basis of a few scattered sales, although one or two grades are off slightly. Pig iron continues duller than usual, and little business is reported in coal and coke.

SEMI-FINISHED STEEL

Buyers of sheet bars are reported to have placed small orders recently at \$29, Pittsburgh or Youngstown, and users of billets and slabs have been offered tonnage at this figure. There have been few transactions to test the market. Forging billets have also been sold at \$35, Pittsburgh, following a nominal quotation of \$36 in the past several months. Wire rods are holding at \$35, the \$37 asking price having virtually disappeared.

PIG IRON

No developments of importance have occurred in this market, which seems to be somewhat duller this month than it was in April. Shipments are lighter and new buying is negligible. The Westinghouse Electric & Mfg. Co. has not closed against

its inquiry for second half requirements at Trafford City, Pa., and Cleveland. In the absence of buying, market prices are generally untested and continue at recent nominal levels.

Prices per gross ton, f.o.b. Valley furnace:

Basic	\$16.50 to \$17.00
Bessemer	17.00
Gray forge	16.50
No. 2 foundry	17.00
No. 3 foundry	16.50
Malleable	17.00
Low phos., copper free....	26.66 to 27.00

Freight rate to Pittsburgh or Cleveland district, \$1.76.

Prices per gross ton f.o.b. Pittsburgh district furnace:

Basic	\$17.00 to \$17.50
No. 2 foundry	17.50
No. 3 foundry	17.00
Malleable	17.50
Bessemer	17.50

Freight rates to points in Pittsburgh district range from 63c. to \$1.13.

RAILS AND TRACK ACCESSORIES

Shipments of both rails and accessories have been fairly well maintained thus far in the month, but releases are lighter and production seems likely to recede. Production of rails in the Pittsburgh district is holding at recent levels.

REINFORCING BARS

Movement of reinforcing bars in the last week has been somewhat heavier, and prospective business is still encouraging. In spite of this, competition among distributors for orders has been very keen, and some very low delivered prices are reported. The mill price is fairly well maintained at 1.65c., Pittsburgh. A Pittsburgh producer has taken an order for 1000 tons for several highway bridges in Wisconsin.

BARS, PLATES AND SHAPES

Business has shown little change in the last week, with structural steel comparatively quiet for this time of the year. While mill order books have been benefited by several outstanding orders, the volume of small awards has been light, and schedules of fabricating shops are unsatisfactory. A bridge over the Mississippi River at New Orleans, requiring 58,000 tons of steel, which had been contemplated, has apparently been postponed indefinitely. In the immediate Pittsburgh territory little new work is coming out, although bids will probably be taken next month on the South Tenth Street bridge over the Monongahela River, requiring 5000 tons of shapes. Prospects for the barge yards have been improved by inquiries for 30 to 47 barges for an oil company and two coal companies, which will take from 5550 to 9030 tons. Other substantial business is in prospect, and barge

A Comparison of Prices

Market Prices at Date, and One Week, One Month and One Year Previous,
Advances Over Past Week in Heavy Type, Declines in Italics

Pig Iron.

Per Gross Ton:	May 19, 1931	May 12, 1931	Apr. 21, 1931	May 20, 1930
No. 2 fdy., Philadelphia.....	\$17.26	\$17.26	\$17.76	\$19.76
No. 2, Valley furnace.....	17.00	17.00	17.00	18.50
No. 2, Southern, Cin'ti.....	14.69	14.69	14.19	16.69
No. 2, Birmingham.....	12.00	12.00	12.00	14.00
No. 2 foundry, Chicago*.....	17.50	17.50	17.50	19.00
Basic, del'd eastern Pa.....	17.00	17.00	17.00	18.75
Basic, Valley furnace.....	16.50	16.50	16.50	18.50
Valley Bessemer, del'd P'gh..	18.76	18.76	18.76	20.76
Malleable, Chicago*.....	17.50	17.50	17.50	19.00
Malleable, Valley.....	17.00	17.00	17.00	19.00
L. S. charcoal, Chicago.....	25.04	25.04	25.04	27.04
Ferromanganese, seaboard...	80.00	80.00	80.00	94.00

Rails, Billets, Etc., Per Gross Ton:

	May 19, 1931	May 12, 1931	Apr. 21, 1931	May 20, 1930
Rails, heavy, at mill.....	\$43.00	\$43.00	\$43.00	\$43.00
Light rails at mill.....	36.00	36.00	36.00	36.00
Revolving billets, Pittsburgh..	29.00	30.00	30.00	33.00
Sheet bars, Pittsburgh.....	29.00	30.00	30.00	33.00
Slabs, Pittsburgh.....	29.00	30.00	30.00	33.00
Forging billets, Pittsburgh...	35.00	36.00	36.00	38.00
Wire rods, Pittsburgh.....	35.00	35.00	35.00	36.00
	Cents	Cents	Cents	Cents
Skelp, grvd. steel, P'gh, lb...	1.65	1.65	1.65	1.80

Finished Steel.

Per Lb. to Large Buyers:	Cents	Cents	Cents	Cents
Bars, Pittsburgh.....	1.65	1.65	1.65	1.75
Bars, Chicago.....	1.70	1.70	1.75	1.85
Bars, Cleveland.....	1.65	1.65	1.70	1.75
Bars, New York.....	1.98	1.98	1.98	2.08
Tank plates, Pittsburgh.....	1.65	1.65	1.65	1.70
Tank plates, Chicago.....	1.70	1.70	1.75	1.80
Tank plates, New York.....	1.93	1.93	1.93	1.98
Structural shapes, Pittsburgh	1.65	1.65	1.65	1.70
Structural shapes, Chicago...	1.70	1.70	1.75	1.80
Structural shapes, New York	1.90 1/2	1.90 1/2	1.90 1/2	1.95 1/2
Cold-finished bars, Pittsburgh	2.10	2.10	2.10	2.10
Hot-rolled strips, Pittsburgh	1.55	1.55	1.55	1.70
Cold-rolled strips, Pittsburgh	2.15	2.15	2.25	2.45

*The average switching charge for delivery to foundries in the Chicago district is 61c. per ton.

On export business there are frequent variations from the above prices. Also, in domestic business, there is at times a range of prices on various products, as shown in our market reports on other pages.

Finished Steel,

Per Lb. to Large Buyers:	May 19, 1931	May 12, 1931	Apr. 21, 1931	May 20, 1930
	Cents	Cents	Cents	Cents
Sheets, black, No. 24, P'gh..	2.15	2.15	2.25	2.55
Sheets, black, No. 24, Chicago	2.35	2.35	2.35	2.65
dist. mill.....	2.80	2.80	2.85	3.20
Sheets, galv., No. 24, P'gh...	2.90	2.90	2.95	3.30
dist. mill.....	2.00	2.00	2.00	2.15
Sheets, blue, No. 13, P'gh...	2.10	2.10	2.15	2.25
dist. mill.....	1.80	1.90	1.90	2.15
Wire nails, Pittsburgh.....	1.95	1.95	1.95	2.20
Wire nails, Chicago dist. mill	2.20	2.20	2.20	2.30
Plain wire, Pittsburgh.....	2.25	2.25	2.25	2.35
Plain wire, Chicago dist. mill	2.55	2.55	2.55	2.80
Barbed wire, galv., P'gh.....	2.60	2.60	2.60	2.85
Barbed wire, galv., Chicago	5.00	5.00	5.00	5.25
dist. mill.....				
Tin plate, 100-lb. box, P'gh..				

Old Material, Per Gross Ton:

	May 19, 1931	May 12, 1931	Apr. 21, 1931	May 20, 1930
Heavy melting steel, P'gh...	\$11.25	\$11.25	\$12.25	\$15.00
Heavy melting steel, Phila...	9.50	9.50	10.25	13.50
Heavy melting steel, Chicago	8.75	8.75	9.75	12.50
Carwheels, Chicago.....	8.75	8.75	9.50	13.75
Carwheels, Philadelphia.....	12.00	12.50	12.50	15.00
No. 1 cast, Pittsburgh.....	11.00	11.00	12.25	14.25
No. 1 cast, Philadelphia.....	11.50	11.50	11.50	14.00
No. 1 cast, Ch'go (net ton)...	9.00	9.00	9.50	12.75
No. 1 RR. wrot., Phila.....	11.00	11.00	11.00	15.00
No. 1 RR. wrot., Ch'go (net)	7.50	7.50	8.25	11.00

Coke, Connellsville, Per Net Ton at Oven:

	May 19, 1931	May 12, 1931	Apr. 21, 1931	May 20, 1930
Furnace coke, prompt.....	\$2.40	\$2.50	\$2.50	\$2.50
Foundry coke, prompt.....	3.50	3.50	3.50	3.50

Metals.

Per Lb. to Large Buyers:	Cents	Cents	Cents	Cents
Lake copper, New York.....	9.12 1/2	9.62 1/2	9.87 1/2	13.12 1/2
Electrolytic copper, refinery..	8.75	8.75	9.50	12.75
Tin (Straits), New York.....	23.50	23.12 1/2	24.62 1/2	31.37 1/2
Zinc, East St. Louis.....	3.35	3.27 1/2	3.62 1/2	4.62 1/2
Zinc, New York.....	3.70	3.62 1/2	3.97 1/2	4.97 1/2
Lead, St. Louis.....	3.60	3.60	4.25	5.40
Lead, New York.....	3.75	3.75	4.50	5.50
Antimony (Asiatic), N. Y....	6.50	6.60	6.85	7.40

builders have sufficient business to maintain a fair rate of operations. Movements of plates to the railroad car builders is very light, and scarcely any new orders are coming in. Demand for skelp by pipe departments is also light, and plate mills are not engaged at more than 40 per cent of capacity. Merchant bars are rather quiet, although shipments to the automobile and accessory makers are holding close to last month's average. The same is true in the case of alloy steel bars.

Prices on bars, plates and shapes show no change, and recent business has offered no test of higher asking prices named earlier in the year by leading makers. It seems likely, however, that mills will devote more attention to establishing the 1.65c., Pittsburgh, price rather than to an advance to 1.70c.

COLD FINISHED STEEL BARS

Shipments this month have fallen under those of the corresponding April period, and little new buying is reported. Operations are holding at

about 35 per cent of capacity with prices maintained at 2.10c., Pittsburgh.

TUBULAR GOODS

Placing of 20,000 tons of 10-in. seamless pipe with a local mill was the feature of the line pipe market in the last week. Other smaller orders are reported, but action has not been taken on other large inquiries which are before the market. The Shell Oil Corp. is reported to be awaiting action by its parent company in the Netherlands before making appropriations for the pipe line running from the east Texas fields. The market on other classes of pipe is rather quiet, with standard material very dull for this season of the year, and oil country casing moving at unchanged levels. Boiler tubes and mechanical tubing are somewhat more active with some producers. Absence of demand from the railroads is very noticeable in the market.

WIRE PRODUCTS

Demand for road mesh and barbed wire is the brightest feature of the

market, with manufacturers' wire very quiet and nail business limited. Fencing is also dull, and distributors' stocks are reported to be ample for this time of the year. Improved agricultural conditions in some parts of the South and West may soon be reflected in better demand for this product. Nail prices are weak, and jobbers in many localities are having no difficulty placing business at \$1.80 a keg. Mills continue to quote \$1.90, and this price seems to be holding in the immediate Pittsburgh district. Manufacturers' wire is quoted at 2.20c., Pittsburgh.

SHEETS

Specifications are unchanged from the previous week, with orders principally for small lots. Most consumers are insisting upon immediate shipment, reflecting low stocks. The automobile industry is maintaining its requirements, and demand from makers of electric refrigerators, metal culverts and pack manufacturers reported to be good. Electrical sheets are very quiet, and demand for steel furniture stock is disappointing. Op-

THE IRON AGE COMPOSITE PRICES

Finished Steel		Pig Iron	Steel Scrap																																																																
May 19, 1931	2.114c. a Lb.	\$15.79 a Gross Ton	\$9.83 a Gross Ton																																																																
One week ago	2.114c.	15.79	9.83																																																																
One month ago	2.128c.	15.79	10.75																																																																
One year ago	2.214c.	17.58	13.67																																																																
Based on steel bars, beams, tank plates, wire, rails, black pipe and sheets. These products make 87 per cent of the United States output.		Based on average of basic iron at Valley furnace and foundry irons at Chicago, Philadelphia, Buffalo, Valley and Birmingham.																																																																	
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erations are still tending downward. The leading interest is running at less than 35 per cent of capacity. Some of the independents are operating at a slightly better rate, but the average for the industry is not above 40 per cent.

Prices are unchanged, with weakness still reported in several lines. Little effort is being made to establish the new selling schedules before third quarter contracting gets under way, although all the leading producers have indicated their intention of adopting the practice at that time.

TIN PLATE

Tin plate production is still easing off slightly, and now averages about 70 per cent of capacity. Shipments are somewhat heavier because of larger releases from the container manufacturers for anticipated tonnage which had been rolled during the winter. Canning companies are watching carryover stocks of vegetables and fruits with considerable interest, but it now seems unlikely that any more than the usual surplus will be available when the new crops are ready.

STRIP STEEL

Demand is very light, but producers generally agree that no further curtailment has been experienced in the last two weeks. Shipments to the automobile industry have held up thus far in the month, and miscellaneous demand is rather steady, if considerably reduced. The total number of orders placed from week to week is rather large considering the small tonnage involved. Talk of higher prices for third quarter persists, and mills are still making an effort to get 1.55c. and 1.65c. on hot-rolled strip. Most of the current business, however, is being taken at prices \$1 a ton less.

Cold-rolled strip is weaker. Reports of shading of \$1 to \$2 a ton are not uncommon.

COKE

Nothing new had developed in the coal and coke business. Producers are

very pessimistic regarding prospects. Furnace coke is quotable at \$2.40, Connellsville, and sales of the foundry product have been made at as low as \$3. The premium brands are still bringing \$4.85. Movement of coal to the lower Lake ports is still light for this season, because of the late opening of Lake navigation. Total shipments this season are expected to fall well behind 1930 tonnage.

OLD MATERIAL

Following two weeks of decline, the scrap market has been marking time in the last few days, with little buying or selling reported to make a test of prices. One consumer is said to have purchased a small tonnage of heavy melting railroad steel at \$11.50, and hydraulic compressed sheets have been sold into consumption at \$11 and \$11.25, representing a slight decline from a week ago. Blast furnace scrap

is softer, with most dealers covered against recent orders. A comparatively large tonnage of heavy breakable cast has been sold at \$9.50. Occasional reports of extremely low dealer buying prices on various grades may generally be traced to distress selling.

Prices per gross ton delivered consumers' yards in Pittsburgh and points taking the Pittsburgh district freight rate:

Basic Open-Hearth Grades:	
No. 1 heavy melting steel...	\$11.00 to \$11.50
No. 2 heavy melting steel...	9.50 to 10.00
Scrap rails.....	10.75 to 11.25
Compressed sheet steel....	10.75 to 11.25
Bundled sheets, sides and ends	8.50 to 9.00
Cast iron carwheels.....	11.50 to 12.00
Sheet bar crops, ordinary...	11.50 to 12.00
Heavy breakable cast.....	8.50 to 9.50
No. 2 railroad wrought....	11.00 to 11.50
Hvy. steel axle turnings...	9.50 to 10.00
Machine shop turnings....	6.50 to 7.00
Acid Open-Hearth Grades:	
Railr. knuckles and couplers	14.00 to 14.50
Railr. coil and leaf springs	14.00 to 14.50
Roller steel wheels.....	14.00 to 14.50
Low phos. billet and bloom ends	15.00 to 15.50
Low phos. mill plates.....	13.00 to 13.50
Low phos. light grades....	13.00 to 13.50
Low phos. sheet bar crops	14.00 to 14.50
Heavy steel axle turnings...	9.50 to 10.00
Electric Furnace Grades:	
Low phos. punchings.....	14.00 to 14.50
Heavy steel axle turnings...	9.50 to 10.00
Blast Furnace Grades:	
Short shoveling steel turnings	7.25 to 7.75
Short mixed borings and turnings	7.25 to 7.75
Cast iron borings.....	7.25 to 7.75
Rolling Mill Grades:	
Steel car axles.....	16.50 to 17.50
Cupola Grades:	
No. 1 cast.....	10.50 to 11.00
Rails 3 ft. and under.....	13.00 to 13.50

Reduction in freight rates on scrap iron and steel in carloads from the Chicago territory to St. Joseph and Benton Harbor, Mich., has been announced by the Pere Marquette Railroad. The former rate was \$2.39 a gross ton, which has been adjusted to \$2.17.

Colorado Fuel & Iron Co. reports a deficit for the first quarter of \$247,214 without deductions for equipment dismantled or for Federal income tax. The total operating profits were \$525,204, against \$2,202,731 in the first quarter of last year.

Warehouse Prices, f.o.b. Pittsburgh

*Base per Lb.	
Plates	2.85c.
Structural shapes	2.85c.
Soft steel bars and small shapes...	2.75c.
Reinforcing steel bars.....	2.75c.
Cold-finished and screw stock—	
Rounds and hexagons.....	3.35c.
Squares and flats.....	3.85c.
Bands	3.10c.
Hoops	4.10c.
Black sheets (No. 24), 25 or more bundles	3.25c.
Galv. sheets (No. 24), 25 or more bundles	3.60c.
Light plates, blue annealed (No. 10)	2.75c. to 3.00c.
Blue annealed sheets (No. 13).....	2.90c. to 3.05c.
Galv. corrug. sheets (No. 28), per square (less than 3750 lb.).....	3.82c.
Spikes, large.....	2.65c.
Small	2.90c. to 3.05c.
Bolt	3.15c.
Track bolts, all sizes, per 100 count, 60 and 10 per cent off list	
Machine bolts, 100 count, 60 and 10 per cent off list	
Carriage bolts, 100 count, 60 and 10 per cent off list	
Nuts, all styles, 100 count, 60 and 10 per cent off list	
Large rivets, base per 100 lb.....	\$3.30
Wire, black, soft ann'd, base per 100 lb.....	2.40
Wire, galv. soft, base per 100 lb.....	2.85
Common wire nails, per keg.....	\$2.10 to 2.15
Cement coated nails, per keg.....	2.15

*On plates, structurals, bars, reinforcing bars, bands, hoops and blue annealed sheets, base applies to orders of 400 to 3999 lb.

CHICAGO

Steel Production Holds at Recent Level—Scrap Market Steadies

CHICAGO, May 19.—Sales of finished steel remain spotty and not heavy in aggregate tonnage, but specifications are sufficient to support ingot output at 48 per cent of capacity in spite of a slight recession in the rail-rolling program, which is counteracted in some measure by heavier releases of track fastenings.

Reports reaching here from the near Northwest are to the effect that structural fabricators in that territory are in a comfortable position as to bookings. In recent weeks shops there have gone far afield for tonnages. In and near Chicago the smaller structural shops have on the whole been faring better than the large fabricators. The reason for this is that large speculative types of structure are not coming up for figures and large public work is slow in developing.

The plate mills are dependent largely on line pipe work. Demand for tanks of the larger size has diminished noticeably in recent weeks, and prospects for new business are not clearly defined. Tank fabricators are rather eagerly seeking new work for their shops.

It is reported from Tulsa, Okla., that the Jones & Laughlin Steel Corp. has taken 20,000 tons of 10-in. pipe for the Sun Pipe Line Co. and the National Tube Co. has booked 12,000 tons of pipe from the Columbia Gas & Electric Co.

The downward swing of scrap prices is checked at least for the time being. However, the outlook is uncertain for the reason that dealers are said to be having trouble in getting credit and without it they are at times forced to liquidate part of their holdings at prices which are below the market. On the other hand, low prices tend to freeze supplies in the hands of producers and therefore one phase of the market may tend to balance the other, thereby making for steadier prices.

FERROALLOYS

Specifications for these commodities are somewhat heavier, though individual releases are usually very small.

PIG IRON

May shipments of Northern foundry iron are turning downward, though the change is small. On the other hand, spot sales are somewhat more active. Prices are steady at \$17.50 a ton, local furnace. The "B" Federal furnace has been taken out of service for extensive repairs, leaving three of six merchant stacks active. The deficiency in output brought about by the blowing out of this stack is being easily made up by operating the fur-

No further decline in steel operations, current specifications supporting a 48 per cent rate.

* * *

Scrap market steadies as supplies become less freely available at current low prices.

* * *

Pig iron shipments turning downward, though change is slight.

* * *

Decline in rail rolling schedules partly offset by heavier releases of track fastenings.

* * *

Russia reported to be negotiating for large lot of farm tractors.

▼ ▼ ▼

naces that are in blast nearer their ratings. The silvery, charcoal iron and Southern iron markets are quiet.

Prices per gross ton at Chicago:

N'th'n No. 2 fdy., sil.	1.75	
to 2.25		\$17.50
N'th'n No. 1 fdy., sil.	2.25	
to 2.75		18.00
Malleable, not over 2.25 sil.		17.50
High phosphorus		17.50
Lake Super. charcoal, sil.		
1.50	\$25.04 to	27.04
S'th'n No. 2 fdy., sil.		17.01
Low phos., sil. 1 to 2, copper free		28.50 to 29.20
Silvery, sil. 8 per cent	24.79 to	26.79
Bess. ferro-silicon, 14-15 per cent		35.79

Prices are delivered consumers' yards except on Northern foundry, high phosphorus and malleable, which are f.o.b. local furnace, not including an average switching charge of 61c. per gross ton.

HOT-ROLLED STRIP

Hot strips 6 in. and narrower are being taken at 1.65c. to 1.75c. a lb., Chicago, and strips wider than 6 in. are quoted at 1.55c. to 1.65c. Consumers continue to buy and also to specify at very close range. Production is not above 45 per cent of capacity.

SHEETS

Local hot mills are being hampered, not alone by the relative scarcity of orders and their small size, but also now by the high temperatures prevailing in this area. Business this week shows little deviation from the volume of previous weeks. Buying in large quantities is almost unheard of; specifications are invariably of such small size that they are difficult to schedule. One group of hot mills is delaying starting each week until Tuesday in order to have the advan-

tage of arranging rolling schedules after the arrival of Monday's mails. Output ranges from 45 to 50 per cent of capacity. While such rates cannot be regarded as satisfactory, there is some consolation in the fact that operations have been holding quite steady in recent weeks. Jobbers are finding a heavier demand for sheets. Mill deliveries of roofing sheets can be had from stock. The price situation is unchanged except that quotations appear to be more stable at present levels. All producers are considering the new schedule, but none here has announced final action.

Base prices per lb., deliv'd from mill in Chicago: No. 24 black sheets, 2.40c. to 2.50c.; No. 24 galv., 2.95c. to 3.05c.; No. 10 blue ann'd, 2.00c. to 2.10c. Deliv'd prices at other Western points are equal to the freight from Gary, plus the mill prices, which are 5c. per 100 lb. lower than Chicago delivered prices.

CAST IRON PIPE

This market is somewhat dull, but sellers of cast iron pipe do not believe that the spring run of business is at an end. Their survey of the situation takes into consideration that this was an election year in many municipalities throughout the Middle West. They point out that new officials, who only recently have taken office, will naturally be slow in getting projected civic improvements under way. Numerous projects are planned, and it is not unlikely that there will be a substantial volume of business in the early summer months. Oakfield, Wis., has ordered 18,000 ft. of 6, 8 and 20-in. pipe from James B. Clow & Sons, and it is reported that the United States Pipe & Foundry Co. has taken 1150 tons at Milwaukee. Chicago still has 5000 tons of 30 to 48-in. pipe to buy, and a project at Appleton, Wis., is still open, though bids have been taken, with Clow the low bidder. Carload orders are rather numerous. The use of cast iron pipe by railroads is light. Public utilities have been slightly more liberal in entering specifications against contracts.

Prices per net ton, deliv'd Chicago: Water pipe, 6-in. and over, \$43 to \$44; 4-in., \$46 to \$47; Class A and gas pipe, \$3 extra.

RAILS AND TRACK SUPPLIES

Specifications against 1931 contracts show only enough variation to drop rail mill production about one point to an average for the district of 42 per cent of capacity. Fresh inquiries are light, and new purchases are confined to a few small lots. About 1000 tons of track supplies have recently been ordered.

WIRE PRODUCTS

May has now advanced far enough to establish definitely that shipments

on the whole are declining in volume. Use of wire by the automobile industry is steady, but miscellaneous manufacturers are taking smaller quantities. Jobbers expect curtailment in buying at this time of year, and the change therefore comes as no surprise to them. The movement of wire mesh remains heavy, as pavement work swings into its full stride.

PLATES

New business in this market is confined to a few scattered orders of small aggregate tonnage. Tank fabricators are more eagerly seeking new work in a market which seems to be less active than earlier in the spring. News from the east Texas oil fields is lacking as to the probable tonnage of tank material needed in that direction. Recent days have witnessed a growth in shipments of plate for pipe manufacture, but this is not significant, for the reason that this tonnage habitually fluctuates at rather frequent intervals. Bids will be opened in a few days by the Northern Pacific on 500 underframes for box cars, and action will be taken soon on 500 superstructure sets. The total steel involved is more than 6000 tons.

BARS

Orders in the aggregate are steady, but consumers are holding shipping instructions and the size of releases as closely as possible to current needs. Compared with other heavy tonnage steel mill products, bars are unquestionably the most active.

Producers' reports on the use of alloy steel bars are not in unison, some noting heavier demand, while others find consumption about steady.

The iron bar market is extremely dull, particularly in view of the fact that users are gradually drifting away from the use of this commodity.

Specifications for rail steel bars are slowly gaining, and new purchases are adding to backlogs. Output is at about 70 per cent of capacity, several units being on two 8-hr. shifts. Prices to the manufacturing trade are steady at 1.60c. to 1.65c. a lb., Chicago Heights mill.

STRUCTURAL MATERIAL

Recent days have developed little of interest in this market. Awards are off rather sharply and fresh inquiries, except on the Pacific Coast, are not large. It is reported that bids on the Chicago Post Office will be delayed and that figures may not be taken until late in June or early in July. It is said that the time for taking bids on a 58,000-ton bridge at New Orleans has been indefinitely postponed. Shops at St. Paul and vicinity report better backlogs, much of which has been drawn from a wide territory. Local shops are faring somewhat better. One large unit is on a five-day week.

BOLTS, NUTS AND RIVETS

Demand has slackened perceptibly in recent days, and there is no longer

the promise that May shipments will about equal deliveries in April. Competition for spot business is growing keener as shown by the fact that case orders are bringing the same discounts as quoted for carlots. Agricultural implement manufacturers continue to scale down operations and are unwilling to venture predictions concerning the future. It is understood that negotiations are again under way with Russia for a large quantity of tractors.

REINFORCING BARS

Road building programs and prices are the center of interest in this market. Shipments to road contractors are growing. The pending tonnage is augmented by 3000 tons for contracts recently let by Illinois.

Price confusion results from the fact that rail steel bar quotations on road work at 1.65c. a lb. and on bridges and culverts at 1.75c. are holding fairly well for local delivery, but when bids are entered on building work the price may sink as low as 1.30c. Building jobs are few and far between and practically all bids are on a lump sum basis. Further, warehouses are not stocking rail steel bars, but are turning the orders to mills for material and fabrication. Dealers find themselves in direct competition with some producers.

COKE

By-product foundry coke is steady at \$7.50 a ton, local ovens. Shipments are lighter than at the beginning of the month.

OLD MATERIAL

The shakedown in scrap iron and steel prices appears to have been halted, temporarily at least. Here and there is found a grade which no longer

can be purchased at a profit to cover an old commitment, and yard dealers are exerting pressure against further lowering of prices. Cast iron borings, which have been sold below \$4 a gross ton, delivered, are giving brokers considerable trouble, for the reason that their offers of \$4 do not bring out tonnage which is needed to cover old commitments.

Several sales of heavy melting steel have been made at \$9 a gross ton for delivery to Gary, and it is understood that additional tonnages are being sought. Several steel producers are reported to be drawing on storage piles because scrap is not coming in sufficiently fast to be unloaded from cars to charging boxes. Several grades, notably cast wheels and steel axles, appear to have been oversold. These factors, plus the tendency for scrap supplies to freeze as prices go lower, are prompting in the minds of some the thought that the bottom of the price structure has been reached or at any rate is very near.

Prices deliv'd Chicago district consumers:
Per Gross Ton

Basic Open-Hearth Grades:	
Heavy melting steel.....	\$8.50 to \$9.00
Shoveling steel.....	8.50 to 9.00
Frogs, switches and guards, cut apart, and misc. rails	8.50 to 9.00
Factory hyd. comp. sheets	7.00 to 7.50
Drop forge flashings.....	6.00 to 6.50
No. 1 busheling.....	6.75 to 7.25
Forg'd cast and r'd steel carwheels.....	11.00 to 11.50
Railroad tires, chark. box size.....	11.50 to 12.00
Railroad leaf springs cut apart.....	11.50 to 12.00
Axle turnings.....	7.00 to 7.50
Acid Open-Hearth Grades:	
Steel couplers and knuckles	9.75 to 10.25
Coil springs.....	11.50 to 12.00
Electric Furnace Grades:	
Axle turnings.....	7.50 to 8.00
Low phos. punchings.....	10.75 to 11.25
Low phos. plates, 12 in. and under.....	10.50 to 11.00
Blast Furnace Grades:	
Cast iron borings.....	3.75 to 4.00
Short shoveling turnings..	3.50 to 4.00
Machine shop turnings....	3.50 to 4.00
Rolling Mill Grades:	
Rerolling rails.....	10.50 to 11.00
Cupola Grades:	
Steel rails, less than 3 ft.	10.75 to 11.25
Steel rails, less than 2 ft.	11.75 to 12.25
Angle bars, steel.....	10.00 to 10.50
Cast iron carwheels.....	8.75 to 9.25
Malleable Grades:	
Railroad.....	10.25 to 10.75
Agricultural.....	9.75 to 10.00
Miscellaneous:	
*Relaying rails, 56 to 60 lb.	19.00 to 21.00
*Relaying rails, 65 lb. and heavier.....	22.00 to 27.00
Per Net Ton	
Rolling Mill Grades:	
Iron angle and splice bars.	9.50 to 10.00
Iron arch bars and transoms.....	10.50 to 11.00
Iron car axles.....	17.50 to 18.50
Steel car axles.....	11.50 to 12.00
No. 1 railroad wrought...	7.50 to 8.00
No. 2 railroad wrought...	7.50 to 8.00
No. 1 busheling.....	6.00 to 6.50
No. 2 busheling.....	4.00 to 4.50
Locomotive tires, smooth..	11.50 to 12.50
Pipes and flues.....	5.50 to 6.00
Cupola Grades:	
No. 1 machinery cast....	9.00 to 9.50
No. 1 railroad cast.....	8.00 to 8.50
No. 1 agricultural cast....	7.00 to 7.50
Stove plate.....	6.25 to 6.75
Grate bars.....	6.00 to 6.50
Brake shoes.....	6.00 to 6.50

*Relaying rails, including angle bars to match, are quoted f.o.b. dealers' yards.

Warehouse Prices, f.o.b. Chicago

	Base per Lb.
Plates and structural shapes.....	3.00c.
Soft steel bars.....	2.90c.
Reinforcing bars, billet steel..	1.70c. to 2.00c.
Rail steel reinforcement—	
For buildings.....	1.45c. to 1.65c.
Highway slabs.....	1.65c.
For bridges and culverts.....	1.75c.
Cold-fin. steel bars and shafting—	
Rounds and hexagons.....	3.35c.
Flats and squares.....	3.85c.
Bands, 3/4 in. (in Nos. 10 and 12 gages).....	3.10c.
Hoops (No. 14 gage and lighter)...	3.65c.
Black sheets (No. 24).....	3.80c.
Galv. sheets (No. 24).....	4.35c.
Blue ann'd sheets (No. 10).....	3.35c.
Spikes (3/4 in. and larger).....	3.45c.
Track bolts.....	4.30c.
Rivets, structural.....	4.00c.
Rivets, boiler.....	4.00c.
Per Cent Off List	
Machine bolts.....	60 and 10
Carriage bolts.....	60 and 10
Coach and lag screws.....	60 and 10
Hot-pressed nuts, sq., tap. or blank.	60 and 10
Hot-pressed nuts, hex., tap. or blank.	60 and 10
No. 8 black ann'd wire, per 100 lb..	\$3.45
Com. wire nails, base per keg.....	2.30
Cement c'd nails, base per keg.....	2.30

CLEVELAND

Steel Orders Decline But Operating Rates Are Unchanged

CLEVELAND, May 19.—The volume of business in finished steel showed a further slight decline the past week. Buying by the motor car industry has become somewhat more restricted, with the probability of some curtailment in production during June. While some business came from that source during the week, it was in small lots for early needs rather than covering June requirements. The local Fisher body plant is operating at peak capacity, or at a rate of over 28,000 Chevrolet bodies per week, and has shown no signs of a curtailment.

Steel plant operations in Cleveland are unchanged at 56 per cent of ingot capacity. Local bar mills are operating at about 50 per cent of capacity. Reports from independent mills indicate very little change in production of sheets and strip. Operations of these mills range from 40 to 50 per cent of capacity, depending on the product.

Little change is reported in operations of metal-working plants in this territory, although some of the local machine shops are considerably busier than recently due to the taking on of machine shop work on airplane forgings.

The outlook in the structural field is fairly promising. This is largely in railroad bridge and grade crossing elimination work. Inquiry is out for 30,000 tons for Louisville & Nashville Railroad bridge over the Ohio River at Henderson, Ky. New York Central grade crossing elimination work at South Bend, Ind., will take 3000 tons, grade crossing elimination work in Toledo will require 600 tons, and the Nickel Plate Railroad contemplates the building of five bridges between Cleveland and Buffalo. Public work in Cleveland includes 1000 tons that will be required for a hospital and an infirmary building, in addition to 620 tons now pending. For a pier in Lorain, 250 tons of sheet steel piling was placed with the Carnegie Steel Co., and 1000 tons of piling is pending at Rochester, N. Y.

PIG IRON

Sales and inquiry show a downward trend. Buying is in small lots for early needs. The inquiry from the Westinghouse Electric & Mfg. Co. is still pending and no other good-sized inquiries have come out. Prices are being well maintained. If the market has any weak spots, inquiries have not been for sufficient tonnage to bring them out. Shipping orders show no change and foundry melt appears to remain at recent levels. Lake furnaces quote foundry and malleable iron at \$16 to \$17 for Ohio and Indiana shipment and \$17 to \$17.50 for

Michigan. Cleveland furnaces quote \$17 for local delivery.

Prices per gross ton at Cleveland:

N'th'n fdy., sil. 1.75 to 2.25.....	\$17.00
S'th'n fdy., sil. 1.75 to 2.25.....	17.01
Malleable	17.50
Ohio silvery, 8 per cent.....	25.00
Stand. low phos., Valley.....	27.00

Prices are f.o.b. furnace except on Southern foundry and silvery iron. Freight rates: 50c. average local switching charge; \$3 from Jackson, Ohio; \$6.01 from Birmingham.

IRON ORE

Water shipments have been very light so far this month, but will be increased considerably this week by the placing in commission of boats of the Pittsburgh Steamship Co. Ore consumption during April amounted to 2,825,647 tons, a decrease of 9792 tons from March. In April last year 4,575,525 tons was consumed. Furnace stocks May 1 amounted to 23,292,605 tons and the amount at furnaces and Lake Erie docks on that date was 28,722,326 tons, against 20,284,503 tons on the same date last year.

BARS, PLATES AND SHAPES

Demand for steel bars from the motor car and other consuming industries has declined. Orders for all the heavier rolled steel products are for small lots. Inquiry for reinforcing bars has also declined. There were no structural awards of size the past week and little new inquiry in this territory, although considerable work is in prospect. Steel bars are firm at 1.65c., Cleveland, for outside shipment and at 1.70c. for local delivery. The higher price applies in some cases for outside shipment to points where competition is less keen.

STRIP STEEL

Demand for hot-rolled strip shows a slight downward tendency, although most mills are maintaining recent operations. Producers feel that present prices are too low and are talking of an advance for the third quarter. One mill has named 1.55c., Pittsburgh, for wide strip and 1.65c. for narrow for current orders, although the ruling

market is still \$1 a ton lower. Cold-rolled strip is unchanged at 2.15c. to 2.25c., Cleveland, but an effort may be made to put this back to a flat 2.25c. for the third quarter.

SHEETS

Orders fell off somewhat the past week. Demand from grave vault manufacturers and some other industries has declined. Orders from refrigerator manufacturers are holding up well. The steel furniture industry is quiet and the demand from stove manufacturers is spotty. Prices are fairly steady at recent levels. Black sheets are quite commonly quoted at 2.15c., Pittsburgh, although a few mills are adhering to 2.25c. Galvanized sheets are weak, concessions from the 2.80c., Pittsburgh, price being made.

WAREHOUSE BUSINESS

Effective May 18, Cleveland jobbers reduced warehouse prices \$2 a ton on hot-rolled bars, hoops and bands and blue annealed sheets. A reduction on bars but not on plates and shapes is in recognition of the Cleveland basing point on bars. The 15c. quantity differential was extended, now covering lots of 1000 to 8000 lb. Formerly the discount did not apply to quantities less than 4000 lb. A base per cut charge for cutting bars replaced the former per 100 lb. charge.

OLD MATERIAL

Prices declined on several grades to new lows the past week and the market has a weak tone. A Valley mill purchased small lots of heavy melting steel at reported prices of \$10.75 for No. 1 and \$9.75 for No. 2. Small tonnages were sold by Cleveland dealers for Valley shipment at as low as \$10.50 for No. 1 and \$9.50 for No. 2.

Prices per gross ton delivered consumers' yards:

Basic Open-Hearth Grades:	
No. 1 heavy melting steel.....	\$9.50 to \$9.75
No. 2 heavy melting steel.....	9.00 to 9.50
Compressed sheet steel.....	8.25 to 8.75
Light bundled sheet	
stampings	7.00 to 7.50
Drop forge flashings.....	7.00 to 7.25
Machine shop turnings.....	5.50
Short shoveling turnings.....	6.25 to 6.75
No. 1 railroad wrought.....	9.50 to 10.00
No. 2 railroad wrought.....	10.00 to 10.50
No. 1 busheling.....	7.50 to 8.00
Pipes and flues.....	5.50 to 6.00
Steel axle turnings.....	7.50 to 8.00

Acid Open-Hearth Grades:	
Low phos., billet bloom and slab crops.....	14.00 to 14.50

Blast Furnace Grades:	
Cast iron borings.....	6.25 to 6.75
Mixed borings and short turnings	6.25 to 6.75
No. 2 busheling.....	6.00 to 6.25

Cupola Grades:	
No. 1 cast.....	10.00 to 10.50
Railroad grate bars.....	6.00 to 6.50
Stove plate.....	6.00 to 6.50
Rails under 3 ft.....	15.00 to 15.50

Miscellaneous:	
Rails for rolling.....	13.00 to 13.50
Railroad malleable	11.00 to 11.25

Warehouse Prices, f.o.b. Cleveland

	Base per Lb.
Plates and struc. shapes.....	2.95c.
Soft steel bars.....	2.75c.
Reinforce. steel bars.....	2.25c. to 2.50c.
Cold-fin. rounds and hex.....	3.40c.
Cold-fin. flats and sq.....	3.90c.
Hoops and bands, No. 12 to 1/2 in., inclusive	3.00c.
Hoops and bands, No. 13 and lighter	3.55c.
Cold-finished strip.....	*5.95c.
Black sheets (No. 24).....	3.60c.
Galvanized sheets (No. 24).....	4.00c.
Blue ann'l'd sheets (No. 10).....	3.00c.
No. 9 ann'l'd wire, per 100 lb.....	\$2.35
No. 9 galv. wire, per 100 lb.....	2.80
Com. wire nails, base per keg.....	2.25

*Net base, including boxing and cutting to length.

NEW YORK

Steel Sales Holding at Recent Levels— Pig Iron Demand Light

NEW YORK, May 19.—Pig iron demand is exceedingly light, and sales in this district probably did not exceed 3000 tons, compared with 4000 tons in the previous week. In this territory there are few open inquiries and most business is uncovered by thoroughly canvassing the trade. Prices remain at \$15 to \$16, furnace, for Buffalo foundry iron, \$16 at furnace for eastern Pennsylvania iron and \$11, Birmingham, for Alabama iron. Delivered prices on eastern New York and New England brands are on a competitive basis. Current orders are too small to develop any new price trend.

In New England an inquiry for 500 to 1000 tons from the H. B. Smith Co., Westfield, Mass., is before the trade.

Prices per gross ton, delivered New York district:

Buffalo No. 2 fdy., sil.	1.75	
to 2.25		\$19.91 to \$20.41
*Buff. No. 2, del'd east.		
N. J.	18.28 to 18.78	
East. Pa. No. 2 fdy., sil.		
1.75 to 2.25	17.39 to 17.89	
East. Pa. No. 2X fdy., sil.		
2.25 to 2.75	17.89 to 18.39	

Freight rates: \$4.91 from Buffalo, \$1.39 to \$2.52 from eastern Pennsylvania.

*Prices delivered to New Jersey cities having rate of \$3.28 a ton from Buffalo.

WAREHOUSE BUSINESS

The volume of buying from warehouses continues slightly better this month than in April, but individual orders are generally for small tonnages. Sales of structural shapes are small, but there is fair demand for mild steel bars and small, bar-sized shapes. Sheet prices are maintained with only occasional concessions.

CAST IRON PIPE

About five miles of 6, 8 and 10-in. water pipe in a contract at Pine Bush, N. Y., has been placed with R. D. Wood & Co. Bids will be opened at Yorktown Heights, N. Y., May 22 on a contract requiring about 500 tons of 6 to 10-in. water pipe. Most of the current buying is limited to small lots of a carload or more. Prices are irregular, ranging from \$31 to \$33 and more a net ton, f.o.b. Northern foundry.

Prices per net ton deliv'd New York:
Water pipe, 6-in. and larger, \$33.90 to \$35.90; 4-in. and 5-in., \$26.90 to \$28.90; 3-in., \$43.90 to \$45.90. Class A and gas pipe, \$3 extra.

REINFORCING BARS

The quotation of 1.65c. a lb., Pittsburgh, or 1.98c., New York, for billet steel reinforcing bars, applies only on small lots of material, concessions on more desirable contracts ranging from \$1 to \$3 a ton. New projects requir-

ing reinforcing bars include a sewer at Sheepshead Bay in Brooklyn, 600 tons, and a total of about 200 tons in New York State armories at Newburgh and Kingston.

FINISHED STEEL

The best that can be said of the local steel situation is that orders are not growing substantially less in volume. While the total for May of most of the district sales offices, according to present indications, may be smaller than the April tonnage, the orders have been running along at about an even rate for the past three or four weeks. About 2500 tons of plates will be bought by the P. T. Cox Contracting Co., 154 Nassau Street, New York, which has finally been awarded the contract for the foundation work of the New York Central freight warehouse to be built on the lower West Side. The Hackensack Water Co., Weehawken, N. J., has awarded a 52-in. water pipe line to T. A. Gillespie Co., New York. About 4000 or 5000 tons of plates probably will be required.

Further price weakness is apparent in galvanized sheets, which are being quite freely sold to jobbers at 2.75c., Pittsburgh. Offers of sheared plates by a jobber for direct mill shipment at low prices have somewhat, disturbed the plate market,

though Eastern mills are obtaining 1.75c., Coatesville, on the ordinary run of orders. There is still a good deal of confusion in the sheet market incident to the introduction of the new classification and new prices and differentials, but mills are working to impress the changes upon the minds of buyers so that contracts for the third quarter can be entered on the new bases.

COKE

Connellsville coke prices are still under pressure. Medium-sulphur furnace coke has sold at as low as \$2.10, Connellsville, and standard furnace coke at \$2.20. Standard foundry coke ranges from \$3.25 to \$3.50, Connellsville, while one or two of the quality brands have been reduced from \$4.85 to \$4.70, Connellsville. Various current coke quotations follow:

Special brands of beehive foundry coke, \$4 to \$4.85 a net ton, ovens, or \$7.71 to \$8.56, delivered to northern New Jersey, Jersey City and Newark, and \$8.59 to \$9.43 to New York and Brooklyn; by-product foundry coke, \$9 to \$9.40, Newark or Jersey City; \$10.06, New York or Brooklyn.

OLD MATERIAL

Brokers buying No. 1 heavy melting steel for eastern Pennsylvania are limiting their purchases at present to a few carloads, on which \$9 to \$9.50 a ton, delivered, is being paid. A Buffalo consumer of No. 1 and No. 2 steel has contracted with a broker for a round tonnage for barge delivery, and the broker is offering \$6.50, on barge, New York, for the No. 1, and \$5.50, on barge, for No. 2 steel. Foundry grade stove plate is off, with brokers offering \$6.75, delivered, West Mahwah, N. J.

Dealers' buying prices per gross ton, f.o.b. New York:

No. 1 heavy melting steel	\$5.50 to \$6.00
Heavy melting steel (yard)	4.00 to 4.50
No. 1 hvy. breakable cast	6.50 to 7.00
Stove plate (steel works)	4.25 to 4.50
Locomotive grate bars	4.25 to 4.50
Machine shop turnings	2.50
Short shoveling turnings	2.50
Cast borings (blast fur. or steel works)	2.50
Mixed borings and turnings	2.25 to 2.50
Steel car axles	12.50 to 13.00
Iron car axles	16.50 to 17.00
Iron and steel pipe (1 in. dia., not under 2 ft. long)	6.25
Forge fire	5.50 to 6.00
No. 1 railroad wrought	8.75
No. 1 yard wrought, long	7.75
Rails for rolling	8.00 to 8.50
Stove plate (foundry)	4.50
Malleable cast (railroad)	8.50 to 9.00
Cast borings (chemical)	8.00 to 8.50

Prices per gross ton, deliv'd local foundries:

No. 1 machry. cast	\$12.00 to \$12.50
No. 1 hvy. cast (columns, bldg. materials, etc.)	10.00 to 10.50
cupola size	
No. 2 cast (radiators, cast boilers, etc.)	9.50 to 10.00

Warehouse Prices, f.o.b. New York

	Base per Lb.
Plates and struc. shapes	2.70c. to 3.10c.
Soft steel bars, small shapes	2.70c. to 3.10c.
Iron bars	3.24c.
Iron bars, Swed. charcoal	7.00c. to 7.25c.
Cold-fin. shafting and screw stock—	
Rounds and hexagons	3.40c.
Flats and squares	3.90c.
Cold-roll, strip, soft and quarter hard	4.95c.
Hoops	3.75c.
Bands	3.40c.
Blue ann'd sheets (No. 10)	3.00c. to 3.25c.
Black sheets (No. 24*)	3.50c.
Galvanized sheets (No. 24*)	4.00c.
Long terme sheets (No. 24)	5.00c.
Standard tool steel	12.00c.
Wire, black annealed	4.50c.
Wire, galv. annealed	5.15c.
Tire steel, ½ x ½ in. and larger	3.40c.
Smooth finish, 1 to 2½ x ¼ in. and larger	3.75c.
Open-hearth spring steel, bases	4.50c. to 7.00c.

*No. 28 and lighter, 36 in. wide, 20c. higher per 100 lb.

	Per Cent Off List
Machine bolts, cut thread:	
¾ x 6 in. and smaller	.65 to .65 and 10
1 x 30 in. and smaller	.65 to .65 and 10
Carriage bolts, cut thread:	
¾ x 6 in. and smaller	.65 to .65 and 10
¾ x 20 in. and smaller	.65 to .65 and 10
Boiler Tubes:	Per 100 Ft.
Lap welded, 2-in.	\$19.00
Seamless steel, 2-in.	20.25
Charcoal iron, 2-in.	26.25
Charcoal iron, 4-in.	67.00

PHILADELPHIA

Steel Operating Rates Unchanged —Buying Meager

PHILADELPHIA, May 19.—Although steel companies have seldom experienced a situation in which orders were for such small quantities as are now being placed, the aggregate is sufficient to maintain mill operations at about the rates of recent weeks. The Bethlehem Steel Co. is operating at about 47 per cent, but other Eastern mills are at 40 per cent, or slightly under that rate.

Prices are generally unchanged despite the small volume of buying. Several of the sheet manufacturers have adopted the new classification promulgated by the American Rolling Mill Co. and are putting the new price schedules into immediate effect. Buyers will get the benefit if the net prices are lower than are now in effect and will not have to pay the higher schedules until the third quarter.

Construction projects requiring steel are limited, but two oil companies in this district are expected to inquire shortly for tank construction in connection with long-distance oil lines. Tank fabricators are bidding on about 50 small tanks, requiring a total of about 1000 tons of plates, which are being inquired for by the Government for use at various air ports.

PIG IRON

Eastern Pennsylvania quotations on foundry iron continue at \$16.50 to \$17 a ton, furnace, and buying is still limited to small lots for prompt shipment. Sellers in this district recently quoted on about 500 tons of No. 1X foundry iron for a Newport News Va., consumer, figuring on barge delivery, but the tonnage is reported to have been placed with a northern New York furnace. Southern pig iron is quoted at \$11 a ton, f.o.b. Birmingham, with current purchases limited to small lots. The furnace at Birdsboro, Pa., has recently completed smelting a cargo of low phosphorus North African iron ore, partly for a local consumer and partly for stock.

Prices per gross ton at Philadelphia:

East. Pa. No. 2, 1.75 to 2.25 sil.....	\$17.26 to \$17.76
East. Pa. No. 2X, 2.25 to 2.75 sil.....	17.76 to 18.26
East. Pa. No. 1X.....	18.26 to 18.76
Basic (del'd east. Pa.)....	17.00 to 17.25
Malleable	19.00 to 20.00
Stand. low phos. (f.o.b. east. Pa. furnace).....	23.00 to 24.00
Cop. b'r'g low phos. (f.o.b. furnace)	22.00 to 23.00
Va. No. 2 plain, 1.75 to 2.25 sil.....	22.29
Va. No. 2X, 2.25 to 2.75 sil.....	22.79

Prices, except as specified otherwise, are deliv'd Philadelphia. Freight rates: 76c. to \$1.64 from eastern Pennsylvania furnaces; \$4.54 from Virginia furnaces.

STEEL BARS

Buying is small. Prices are unchanged at 1.60c. to 1.65c., Pittsburgh, or 1.89c. to 1.94c., delivered Philadelphia. Reinforcing bar prices still lack firmness, especially on desirable projects, so that the price of 1.65c., Pittsburgh, or 1.94c., Philadelphia, for billet steel bars, applies only on lots of a carload or less, with concessions of \$1 and \$2 a ton on larger contracts. Rail steel bars are quoted at 1.20c. to 1.30c., Pittsburgh, or 1.49c. to 1.59c., Philadelphia. The only recent award of reinforcing bars of size was 290 tons in a reservoir for the York Water Co., York, Pa.

PLATES

Mills have small backlogs of orders on their books, but are quoting on some fair tonnages for tank work. Prices continue at 1.75c., Coatesville, Pa., or 1.85½c., Philadelphia, with 1.70c., Coatesville, or 1.80½c., occasionally quoted on desirable business.

SHAPES

Quotations are unchanged at 1.70c. to 1.75c. per lb., f.o.b. nearest mill to consumer, or 1.76c. to 1.81c., delivered Philadelphia. Fabricators are bidding on a few small tonnage contracts and are generally in need of new business. A Post Office at Camden, N. J., requiring 820 tons of structural steel has been awarded to the Shippers Car Line, Milton, Pa.

SHEETS

Most sheet mills are still quoting prices on the old sheet classification, but the company which recently announced the new classification is using the new bases and extras. These are 1.70c., Pittsburgh, or 1.99c., Philadelphia, for No. 10 gage hot-rolled and 2.40c., Pittsburgh, or 2.69c., Philadelphia, for No. 24 gage hot-rolled annealed, 2.95c., Pittsburgh, or 3.24c., Philadelphia, for No. 20 gage cold-rolled light, and 2.35c., Pittsburgh,

or 2.64c., Philadelphia, for No. 10 gage heavy sheets. Quotations under the old classifications are 2.15c. to 2.25c., Pittsburgh, or 2.44c. to 2.54c., Philadelphia, for black, and 2.75c. to 2.85c., Pittsburgh, or 3.04c. to 3.14c., Philadelphia, for galvanized. Blue annealed sheets, No. 13 gage, are 2c., Pittsburgh, or 2.29c., Philadelphia, and blue annealed plates, No. 10 gage, are 1.85c., Pittsburgh, or 2.14c., Philadelphia. Most of the current orders for sheets are for less than a carload, but a shipbuilder in this district has placed about 200 tons of black and blue annealed sheets for delivery into November.

IMPORTS

In the week ended May 16, 3539 tons of pig iron arrived at this port, of which 3439 tons was from British India and 100 tons from Belgium. Three tons of manganese ore was received from Germany. Steel arrivals consisted of 18 tons of structural shapes and 14 tons of bands from Belgium and 100 tons of structural shapes from Germany.

OLD MATERIAL

Prices of certain grades of scrap, especially turnings, have declined to a level where dealers no longer find it profitable to handle them. With an eastern Pennsylvania steel company furnace blowing out this month, holders of blast furnace scrap are further limited in their market. Dealers were generally unwilling to bid on a small tonnage of blast furnace material recently offered by a Wilmington, Del., company.

Prices per gross ton delivered consumers' yards, Philadelphia district:

No. 1 heavy melting steel..	\$9.00 to \$10.00
No. 2 heavy melting steel..	7.50 to 8.00
Heavy melting steel (yard)	7.00 to 7.50
No. 1 railroad wrought...	11.00 to 11.50
Bundled sheets (for steel works)	6.50
Hydraulic compressed, new	8.00 to 8.50
Hydraulic compressed, old	7.00 to 7.50
Machine shop turnings (for steel works)	6.00 to 6.50
Heavy axle turnings (or equiv.)	9.00 to 9.50
Cast borings (for steel works and roll. mill)...	6.50 to 7.00
Heavy breakable cast (for steel works)	10.50 to 11.00
Railroad grate bars.....	8.50
Stove plate (for steel works)	8.50
No. 1 low phos., hvy. (0.04% and under)....	15.00 to 15.50
Couplers and knuckles...	13.00 to 13.50
Roller steel wheels.....	13.00 to 13.50
No. 1 blast f'nace scrap...	5.50
Wrot. iron and soft steel pipes and tubes (new specific)	11.50
Shafting	16.50 to 17.00
Steel axles	16.50 to 17.00
No. 1 forge fire.....	9.50 to 10.00
Cast iron carwheels.....	12.00 to 12.50
No. 1 cast	12.00 to 12.50
Cast borings (for chem. plant)	13.00 to 14.00
Steel rails for rolling....	12.00 to 13.00

Warehouse Prices, f.o.b. Philadelphia

	Base per Lb.
Plates, ¼-in. and heavier.....	2.50c.
Structural shapes	2.50c.
Soft steel bars, small shapes, iron bars (except bands).....	2.60c.
Reinforc. steel bars, sq. twisted and deform.....	2.50c. to 2.60c.
Cold-fin. steel, rounds and hex....	3.40c.
Cold-fin. steel, sq. and flats.....	3.90c.
Steel hoops	3.15c.
Steel bands, No. 12 to ¾-in. inclu..	2.90c.
Spring steel.....	5.00c.
*Black sheets (No. 24).....	3.50c.
†Galvanized sheets (No. 24).....	3.95c.
Light plates, blue annealed (No. 10)	3.05c.
Blue ann'd sheets (No. 13).....	3.20c.
Diam. pat. floor plates, ¼-in.....	5.20c.
Swedish iron bars.....	6.60c.

*For 50 bundles or more; 10 to 40 bun., 4.10c. base; 1 to 9 bun., 4.35c. base.
†For 50 bundles or more; 10 to 49 bun., 4.95c. base; 1 to 9 bun., 5.30c. base.

BOSTON

Pig Iron and Scrap Markets Dull— Fabricated Steel Lettings Gain

BOSTON, May 19.—Indications are that May sales of pig iron will be the smallest for any month in many years. Buying is at a minimum, orders the past week having fallen well below 1000 tons. With the New England foundry industry operating at not more than 15 to 20 per cent of capacity, there is little hope for increased sales during the remainder of May, at least. Furnaces generally are maintaining base prices, but silicon differentials are somewhat elastic.

Foundry iron prices per gross ton deliv'd to most New England points:

*Buffalo, sil. 1.75 to 2.25...	\$19.91 to \$20.91
*Buffalo, sil. 2.25 to 2.75...	19.91 to 20.91
†Buffalo, sil. 1.75 to 2.25...	19.28 to 20.28
†Buffalo, sil. 2.25 to 2.75...	19.28 to 20.28
*Ala., sil. 1.75 to 2.25...	20.11 to 20.61
*Ala., sil. 2.25 to 2.75...	20.61 to 21.11
†Ala., sil. 1.75 to 2.25...	16.75
†Ala., sil. 2.25 to 2.75...	17.25

Freight rates: \$4.91 all rail from Buffalo; \$9.61 all rail from Alabama and \$5.75 rail and water from Alabama to New England seaboard.

*All rail rate.

†Rail and water rate.

CAST IRON PIPE

Buying has quieted down. Awards the past week were confined to 233 tons of 8-in. Class 150 pipe and 91 tons of 6 in. to R. D. Wood & Co. by New Britain, Conn.; 100 tons of pipe and fittings to the Warren Foundry & Pipe Co. by Springfield, Mass.; 100 tons of Class C to Allen & Reed by East Providence, R. I.; 100 tons to the Warren Foundry & Pipe Co. by Lawrence, Mass., and approximately 300 tons in 10 to 20-ton lots. Prices are still unsettled, with \$34 a ton, foundry, the general asking price on 6-in. Class B pipe and larger sizes.

REINFORCING STEEL

Lettings are few and far between, recent bookings not exceeding 200 tons, all in small lots. It is expected that 400 tons for two schools, 170 tons

for a local power house addition, 350 tons for a Jamaica Plains warehouse and more than 300 tons for State bridges in Massachusetts will be awarded within a week. Billet steel bars from stock are: One to 5-ton lots, 3c. a lb., base; 6 to 99 tons, 2.40c.; 100-ton lots and larger, 2.30c. Rail steel bars are 2.26½c. a lb., Boston rate points.

FABRICATED STEEL

The past week was the most active in some time. Awards were 2262 tons. About 2000 tons came up for figures. Included in the awards was a 26-in. welded pipe line for Portland, Me., taken by the C. & R. Construction Co. at \$48,955. Bids close May 21 on 8400 ft. of 60-in. steel pipe for a water line between Newton and Watertown, Mass. The Portland, Me., court house addition, involving 200 tons of fabricated steel, will be figured again. A State bridge between Deerfield and Greenfield, Mass., calling for 800 tons of steel, will be let this week.

OLD MATERIAL

Further weakness in steel turnings, steel mill borings, bundled skeleton,

pipe and breakable cast has developed. Steel turnings on cars here are \$1.50 to \$1.75 a ton, equivalent to \$5.91 to \$6.16, delivered Pittsburgh district. Heavy melting steel is \$5 to \$5.50 a ton on cars here, or \$10.70 to \$11.20, delivered Pittsburgh. Mills will not buy at these delivered prices, and owners of scrap will not sell at local prices unless pressed for cash. Scrap activity is confined to an occasional car of No. 1 heavy melting steel, T rails, skeleton, textile and machinery cast and breakable cast for New England delivery.

Buying prices per gross ton, f.o.b. Boston rate shipping points:

No. 1 heavy melting steel...	\$5.00 to \$5.25
Scrap T rails.....	5.00 to 5.25
Scrap girder rails.....	4.00 to 4.25
No. 1 railroad wrought...	7.00 to 7.50
Machine shop turnings...	1.50 to 1.75
Cast iron borings (steel works and rolling mill)	1.50 to 1.75
Bundled skeleton, long...	4.50 to 5.00
Forge flashings.....	5.00 to 5.25
Blast furnace borings and turnings.....	1.50 to 1.75
Forge scrap.....	5.00 to 5.25
Shafting.....	10.00 to 10.50
Steel car axles.....	11.00 to 12.00
Wrought pipe, 1 in. in diameter (over 2 ft. long)	5.00 to 5.25
Rails for rolling.....	7.50 to 8.00
Cast iron borings, chemical	7.00 to 8.50
No. 2 cast.....	5.00 to 5.25

Prices per gross ton deliv'd consumers' yards:

Textile cast.....	\$9.00 to \$10.00
No. 1 machinery cast.....	9.00 to 10.00
Stove plate.....	5.00 to 5.25
Railroad malleable.....	13.00 to 13.50

BIRMINGHAM

BIRMINGHAM, May 19.—Demand for pig iron is still confined to immediate needs, with orders mostly for small lots and prompt shipment. There has been a slight recession in the melt of consumers and this has been reflected in shipments. Quotations are being maintained at \$12 to \$13. There is no incentive for the average buyer to stock up on forward tonnage, as shipments can be secured as required and price changes upward are unlikely at present. Thirteen furnaces continue in operation. There was one change last week, the Tennessee company switching Ensley No. 5 from ferromanganese to foundry iron.

Prices per gross ton, f.o.b. Birmingham dist. furnaces:

No. 2 fdy., 1.75 to 2.25 sil.	\$12.00 to \$13.00
No. 1 fdy., 2.25 to 2.75 sil.	12.50 to 13.50
Basic.....	12.00 to 13.00

CAST IRON PIPE

Second quarter business continues to be disappointing. This period is generally one of considerable sales activity for Southern manufacturers of pressure pipe, but the volume of new business is still far from what was expected, even with conditions as they are. Plant operations are said to be around 50 per cent, as compared with 60 and 65 per cent several weeks ago. New tonnage is mostly in small

Cast Iron Pipe Business Below Seasonal Expectations

lots. Quotations are unchanged at \$35 to \$36.

FINISHED STEEL

Buying is light. Demand for structural steel and reinforcing bars is off. Fabricators of structural steel have had very little business in recent weeks, and plant operations are being curtailed. Reinforcing bar fabricators report a reasonable amount of small orders. Bars for the Harvey Canal lock at New Orleans, amounting to about 3000 tons, are still pending. Steel-making operations of the Gulf States Steel Co. and Tennessee company are the same as last week, 11 furnaces being in service.

OLD MATERIAL

One large consumer has stopped shipments entirely and others have decreased their requirements. Quotations may be revised downward this week.

Prices per gross ton deliv'd Birmingham dist. consumers' yards:

Heavy melting steel.....	\$9.50 to \$10.00
Scrap steel rails.....	10.00
Short shoveling turnings...	7.50
Cast iron borings.....	(No market)
Stove plate.....	7.50
Steel axles.....	15.00 to 16.00
Iron axles.....	18.00
No. 1 railroad wrought...	8.00
Rails for rolling.....	11.50 to 12.00
No. 1 cast.....	10.00
Tramcar wheels.....	11.00 to 11.25
Cast iron borings, chem....	13.50
Cast iron carwheels.....	11.00

Warehouse Prices, f.o.b. Boston

	Base per Lb.
Plates.....	3.36½c.
Structural shapes—	
Angles and beams.....	3.36½c.
Tees.....	3.36½c.
Zees.....	3.36½c.
Soft steel bars, small shapes...	3.26½c.
Reinforcing bars.....	3.11½c. to 3.26½c.
Iron bars—	
Refined.....	3.26½c.
Best refined.....	4.60c.
Norway rounds.....	6.60c.
Norway squares and flats.....	7.10c.
Spring steel—	
Open-hearth.....	5.00c. to 10.00c.
Crucible.....	12.00c.
Tire steel.....	4.50c. to 4.75c.
Bands.....	4.915c. to 5.00c.
Hoop steel.....	5.50c. to 6.00c.
Cold-rolled steel—	
Rounds and hex.....	3.50c. to 5.50c.
Squares and flats.....	4.00c. to 6.00c.
Toe calk steel.....	6.00c.
Rivets, structural or boiler.....	4.80c.

Per Cent Off List

Machine bolts.....	.60 and 5
Carriage bolts.....	.60 and 5
Lar screws.....	.60 and 5
Hot-pressed nuts.....	.60 and 5
Cold-punched nuts.....	.60 and 5
Stove bolts.....	.70 and 10

ST. LOUIS

Release of Railroad Orders Increases Steel Melt—Scrap Still Weak

ST. LOUIS, May 19.—An increase in the melt of pig iron by the steel mills in the St. Louis district is reported. A principal factor in the increase of heats has been the request of railroads to speed up shipments of finished products which had been held up for some time. Most of the slump in the business of the steel plants here has been due to the lack of orders from the railroads. The improvement has not yet reached the stage of a heavier buying movement of pig iron. The gray iron foundries show no increase in melt. The market is unchanged, but there has not been a sufficient amount of interest shown by melters to determine accurately its tone.

Prices per gross ton at St. Louis:

No. 2 fdy., sil. 1.75 to 2.25, f.o.b.	
Granite City, Ill.	\$17.50
Malleable, f.o.b. Granite City	17.50
N'th'n No. 2 fdy., deliv'd St. Louis	19.66
Southern No. 2 fdy., deliv'd	15.42
Northern malleable, deliv'd	19.66
Northern basic, deliv'd	19.66

Freight rates: 75c. (average) Granite City to St. Louis; \$2.16 from Chicago; \$4.42 from Birmingham.

FINISHED STEEL

A leading railroad has agreed to take during May the remainder of its orders for rails held over from last year, amounting to a considerable tonnage, thus providing the most favorable news of the week. The Granite City Steel Co. reports that a very satisfactory demand for blue annealed sheets and light plates continues. A good volume also is being done in tin plate, specifications of can manufacturers being normal for this time of year. There is no great demand for galvanized sheets or for black sheets or plates. The Laclede Steel Co. received the awards of 1200 to 1500 tons of reinforcing bars for Principia College buildings and 100 tons of the same material for a library in Evansville, Ind. The only new projects are

270 tons of reinforcing bars for a St. Louis public school and 200 tons of structural for Principia College, Alton. The Sun Oil Co. has awarded 25,000 tons of 10-in. pipe to Jones & Laughlin Steel Corp. for an east Texas pipe line.

OLD MATERIAL

The scrap market is without activity. Mills are not buying anything, nor are the dealers, who have about cleaned up outstanding orders. Dealers feel that present prices and the outlook for the future would not justify their laying down any considerable tonnage. Miscellaneous standard-section rails are 25c. off, while No. 1 machinery cast and No. 1 railroad cast are 50c. lower.

Railroad lists: Louisville & Nashville, 7000 tons; Chicago, Burlington & Quincy, 3250 tons; Missouri-Kansas-Texas, 3000 tons; International Great Northern, 1347 tons; Chicago & Alton, 645 tons; St. Louis South-

western, St. Louis-San Francisco, and Chicago, Milwaukee, St. Paul & Pacific, 22 carloads each; Pullman Co. (St. Louis), 7 carloads.

Dealers' buying prices per gross ton, f.o.b. St. Louis district:

Selected heavy melting steel	\$8.25 to \$8.75
No. 1 heavy melting or shoveling steel	8.00 to 8.50
No. 2 heavy melting or shoveling steel	7.50 to 8.00
No. 1 locomotive tires	10.00 to 10.50
Misc. stand-sec. rails including frogs, switches and guards, cut apart	8.75 to 9.25
Railroad springs	10.00 to 10.50
Bundled sheets	6.00 to 6.50
No. 2 railroad wrought	8.00 to 8.50
No. 1 busheling	5.75 to 6.25
Cast iron borings and shoveling turnings	5.50 to 6.00
Iron rails	8.00 to 8.50
Rails for rolling	10.00 to 10.50
Machine shop turnings	2.75 to 3.25
Heavy turnings	6.00 to 6.50
Steel car axles	12.00 to 12.50
Iron car axles	17.50 to 18.00
Wrot. iron bars and trans.	9.00 to 9.50
No. 1 railroad wrought	6.00 to 6.50
Steel rails, less than 3 ft.	11.00 to 11.50
Steel angle bars	8.00 to 8.50
Cast iron carwheels	7.00 to 7.50
No. 1 machinery cast	8.00 to 8.50
Railroad malleable	8.25 to 8.75
No. 1 railroad cast	8.00 to 8.50
Stove plate	7.00 to 7.50
Relay. rails, 60 lb. and under	16.00 to 16.50
Relay. rails, 70 lb. and over	20.00 to 21.00
Agricult. malleable	7.50 to 8.00

PACIFIC COAST

Steel Business Continues to Lag—Construction Work Most Active Line

SAN FRANCISCO, May 16.—Movement of iron and steel products on the Pacific Coast continues to lag. Few sales or inquiries of importance developed during the week. Engineering construction work is active and is taking the bulk of the tonnage. The price structure is not strong.

BARs

Mill prices on mild steel bars remain unchanged at 2.10c., c.i.f. Sales and inquiries involve small lots for quick shipment. Out-of-stock quotations on reinforcing steel in the San Francisco district hold at 2.60c., base, on carload lots. Los Angeles prices appear to be firm at 2.50c., base. Awards exceeded 800 tons and included 200 tons for two wing additions to the State Building, Los Angeles, and 200 tons for a film laboratory in the same city, both placed with unnamed interests. A patients' building at the Veterans' Hospital, Tucson, Ariz., involving 100 tons, went to an unnamed interest. Bids will be opened May 27 on 268 tons for a bridge over the Santa Clara River in Ventura County, Cal.

PLATES

Little of importance has transpired in the plate market of late. Fabricators' attention is centered in opening of bids May 20 on 35,000 tons for the Hetch Hetchy pipe line, San Francisco. Morrison-Knudsen Co., Boise, Idaho, was low bidder on 1000 tons of 30 and 36-in. welded steel pipe

Pig iron prices per gross ton at San Francisco:

*Utah basic	\$22.00 to \$24.00
*Utah fdy., sil. 2.75 to 3.25	22.00 to 24.00
**Indian fdy., sil. 2.75 to 3.25	22.00 to 24.00

*Delivered San Francisco.

**Duty paid, f.o.b. cars San Francisco.

for Salt Lake City. Bids have been opened on two floating derricks for the Navy Department, one for Mare Island and the other for San Diego. About 300 tons is involved. Seattle will call for bids for 110 tons for two steel standpipes. The usual quotation is 2c., c.i.f.

SHAPES

Structural specifications are developing slowly. Few projects of importance are up for figures. The Consolidated Steel Corp. booked 500 tons for two additional wings for the State Building, Los Angeles. The Herick Iron Works took 175 tons for a warehouse for the Oakland Port Com-

Warehouse Prices, f.o.b. St. Louis

	Base per Lb.
Plates and struc. shapes	3.25c.
Bars, soft steel or iron	3.15c.
Cold-fin. rounds, shafting, screw stock	3.60c.
Black sheets (No. 24)	4.05c.
Galv. sheets (No. 24)	4.60c.
Blue ann'd sheets (No. 10)	3.45c.
Black corrug. sheets (No. 24)	4.10c.
Galv. corrug. sheets	4.65c.
Structural rivets	4.15c.
Boiler rivets	4.15c.
Per Cent Off List	
Tank rivets, 7/8-in. and smaller, 100 lb. or more	65
Less than 100 lb.	60
Machine bolts	60 and 10
Carriage bolts	60 and 10
Lag screws	60 and 10
Hot-pressed nuts, sq., blank or tapped, 200 lb. or more	60 and 10
Less than 200 lb.	50 and 10
Hot-pressed nuts, hex., blank or tapped, 200 lb. or more	60 and 10
Less than 200 lb.	50 and 10

Warehouse Prices, f.o.b. San Francisco

	Base per Lb.
Plates and struc. shapes	2.50c.
Soft steel bars	2.50c.
Black sheets (No. 24)	4.15c.
Blue ann'd sheets (No. 10)	3.05c.
Galv. sheets (No. 24)	4.65c.
Struc. rivets, 1/2-in. and larger	5.00c.
Com. wire nails, base per keg	\$3.35
Cement c'd nails, 100 lb. keg	3.35

mission. Unnamed interests secured 303 tons and 198 tons respectively for a bridge over the Eel River at Dryer-ville, Cal., and a bridge over Clear Creek in Shasta County, Cal. Bids will be opened May 27 on 2000 tons of structurals for a bridge over the Santa Clara River in Ventura County, Cal. Bids were opened on 113 tons for a bridge over the Trinity River, Trinity County, Cal. Shapes continue to range from 2.05c. to 2.15c., c.i.f.

CAST IRON PIPE

Demand for cast iron pipe is practically at a standstill. Only one

award was reported this week. Unnamed interests took 176 tons of 6 and 8-in. Class C pipe for San Diego. Bids were opened on 413 tons of 20-in. Class B pipe for a sewer project for Los Angeles.

SHEETS

The bulk of the sheet business is made up of small lots for immediate shipment. No outstanding inquiries have been in the market lately. No. 10 gage blue annealed sheets are quoted at 2.50c., c.i.f. No. 24 black sheets hold at 3c. and No. 24 galvanized sheets are quoted at 3.50c., c.i.f.

planning to advance prices on hot-rolled material to 1.55c. and 1.65c., Pittsburgh, from levels \$1 a ton lower, which have been rather general recently. Adoption of the new schedules of quotations on sheets announced recently will result in higher selling prices on several lines of sheets. On current business, present quotations are rather soft. Bars are fairly well maintained at 1.65c., Pittsburgh, with 1.70c. still quoted in some cases. Nails have settled to \$1.90 a keg, the recent \$2 asking price having generally disappeared. Manufacturers' wire is quotable at 2.20c. to 2.30c. a lb.

Sheet bars have been sold at \$29, Pittsburgh or Youngstown, and billets and slabs are available from some producers at the same figure. Other sellers cling to the nominal \$30 quotations and claim to have made no recent sales. Pig iron is quiet, but declining scrap prices are still attracting considerable interest. No. 1 heavy melting steel is not quotable at more than \$11 and hydraulic compressed sheets are slightly lower. Blast furnace scrap has also eased off in this district and specialties are weaker.

YOUNGSTOWN

YOUNGSTOWN, May 18.—Specifications for finished steel products received by Valley mills during the first half of May fell only slightly under those of the corresponding April period and compared favorably with orders of the latter half of that month. Production of both raw and finished steel has been materially reduced in the last six weeks, and present output is well adjusted to lighter requirements of consumers. With shipments to the automotive industry well maintained, it is unlikely that any further curtailment in output will come this month, although an almost certain decline in automobile production during June will soon be felt in releases for sheets, strip steel and bars.

Ingot production last week held closely to the previous week's levels, with 21 of the district's 52 available open-hearth units in operation. No further decline is expected this week. Sheet production, which gained slightly last week, is not expected to be as heavy, and output is not above 40 per cent of theoretical capacity. Strip mills are running intermittently, and the average for the month to date has been about 40 per cent on hot-rolled material and 25 per cent on cold-rolled. Bar, plate and wire mills are holding their own, with pipe production very light.

Valley steel companies still look to the building industry to provide them considerable business during the slow summer months. Fabricators in the district are engaged at about 75 per cent of capacity and will likely be able to hold this rate for some time. Fabricators of steel tanks are not running very well, but producers of stampings have considerable business ahead of them. Heavy machinery builders are also rather busy. Makers of pipe have received a few small orders this month, but their share of total business placed has not been impressive. Such business may yet benefit the Valleys considerably during the summer.

Interest in prices is centered on the

Steel Production Fairly Steady at About 40 Per Cent

future, with current quotations fairly well maintained on the small volume of business being placed currently. While consumers have shown no interest in third quarter requirements, makers of strip steel are already

CINCINNATI

CINCINNATI, May 19.—A further slackening in demand for pig iron is noticeable. Sales last week were about 1500 tons. Current orders are usually for less than 100 tons. Excepting a few foundries making automotive castings, the local melt is very low. Prices on Southern iron appear to be well maintained, while Northern quotations are affected by keen competition for business in the larger cities in this district. Some iron from a Buffalo furnace has been sold in this area during the last few weeks at prices said to be below those recently quoted by other Northern furnaces. The only sizable inquiry is from an Indiana consumer for 500 tons of Northern foundry iron.

Prices per gross ton, deliv'd Cincinnati:
Ala. fdy., sil. 1.75 to 2.25.....\$14.69
Ala. fdy., sil. 2.25 to 2.75..... 15.19
Tenn. fdy., sil. 1.75 to 2.25..... 14.69
S'th'n Ohio silvery, 8 per cent..... 23.89

Freight rates, \$1.89 from Ironton and Jackson, Ohio; \$3.69 from Birmingham.

FINISHED STEEL

Current orders for sheets are sufficient to sustain mill operations at a little better than 50 per cent of capacity, which is the schedule that has been followed for the last two or three weeks. Aside from the usual seasonal uptrend in use of sheets for road construction, there is no expan-

Pig Iron Demand at Low Ebb—Scrap Prices Lower

sion in demand from any one source, but orders are from widely diversified consuming lines.

OLD MATERIAL

Users of scrap are very cautious in their purchases. Dealers' bids softened somewhat during the last week. Reductions ranging from 25c. to \$1 a ton have been made on heavy melting steel, No. 1 busheling, No. 2

Warehouse Prices, f.o.b. Cincinnati

	Base per Lb.
Plates and struc. shapes.....	3.25c.
Bars, soft steel or iron.....	3.15c.
New billet reinforce. bars.....	3.15c.
Rail steel reinforce. bars.....	3.00c.
Hoops	3.90c.
Bands	3.35c.
Cold-fin. rounds and hex.....	3.80c.
Squares	4.30c.
Black sheets (No. 24).....	3.90c.
Galvanized sheets (No. 24).....	4.40c.
Blue ann'd sheets (No. 10).....	3.45c.
Structural rivets	4.20c.
Small rivets60 per cent off list
No. 9 ann'd wire, per 100 lb.....	\$3.00
Com. wire nails, base per keg (25	
kegs or more).....	2.95
Cement c'd nails, base 100 lb. keg	2.95
Chain, per 100 lb.....	10.25
Net per 100 Ft.	
Lap-welded steel boiler tubes, 2-in..	\$16.50
4-in.	34.50
Seamless steel boiler tubes, 2-in....	17.50
4-in.	36.00

railroad wrought, short rails, burnt cast, stove plate, brake shoes, agricultural malleable and railroad malleable.

Dealers' buying prices per gross ton, f.o.b. cars, Cincinnati:

Heavy melting steel.....	\$8.25 to	\$8.75
Scrap rails for melting...	10.25 to	10.75
Loose sheet clippings.....	4.50 to	5.00
Bundled sheets.....	7.75 to	8.25
Cast iron borings.....	4.75 to	5.25
Machine shop turnings.....	5.00 to	5.50
No. 1 busheling.....	6.75 to	7.25
No. 2 busheling.....	4.25 to	4.75
Rails for rolling.....	11.50 to	12.00
No. 1 locomotive tires.....	9.50 to	10.00
No. 2 railroad wrought...	8.25 to	8.75
Short rails.....	13.00 to	13.50
Cast iron carwheels.....	10.50 to	11.00
No. 1 machinery cast.....	12.50 to	13.00
No. 1 railroad cast.....	11.50 to	12.00
Burnt cast.....	5.25 to	5.75
Stove plate.....	5.25 to	5.75
Brake shoes.....	5.25 to	5.75
Agricultural malleable.....	10.00 to	10.50
Railroad malleable.....	11.00 to	11.50

Canada

Pig Iron and Scrap Markets Dull

TORONTO, May 19.—Demand for merchant pig iron is running to small spot orders. Melters are not placing contracts for forward delivery, although those who are covered for this quarter are taking regular shipments. Prices are unchanged.

Prices per gross ton:

Delivered Toronto	
No. 1 fdy., sil. 2.25 to 2.75.....	\$22.60
No. 2 fdy., sil. 1.75 to 2.25.....	22.10
Malleable.....	22.60
Delivered Montreal	
No. 1 fdy., sil. 2.25 to 2.75.....	\$24.00
No. 2 fdy., sil. 1.75 to 2.25.....	23.50
Malleable.....	24.00
Basic.....	20.50

STRUCTURAL STEEL

While there is a good prospective demand for building steel, sales in the past two or three weeks have been small. Building programs, in many instances, are being put off pending improvement in general business.

OLD MATERIAL

Local dealers report little activity in this market. Consumers are adhering to hand-to-mouth methods of buying. Steel scrap is moving slowly to the Hamilton district, while consumers in other parts of Ontario and Quebec are showing very little interest. Prices are unchanged.

Dealers' buying prices for old material:
Per Gross Ton

	Toronto	Montreal
Heavy melting steel.....	\$7.00	\$6.00
Rails, scrap.....	7.00	6.00
No. 1 wrought.....	6.00	8.00
Machine shop turnings.....	2.00	2.00
Boiler plate.....	5.00	4.50
Heavy axle turnings.....	2.50	2.50
Cast borings.....	2.00	2.00
Steel borings.....	2.00	2.00
Wrought pipe.....	2.00	2.00
Steel axles.....	7.00	9.00
Axles, wrought iron.....	7.00	11.00
No. 1 machinery cast.....	10.00	10.00
Stove plate.....	8.00	8.00
Standard carwheels.....	8.50	8.50
Malleable.....	8.00	8.00
Per Net Ton		
No. 1 mach'y cast.....	11.00
Stove plate.....	9.00
Standard carwheels.....	10.00
Malleable scrap.....	9.00

BUFFALO

Steel Operations Unchanged—Pig Iron and Scrap Extremely Dull

BUFFALO, May 19.—Sales of pig iron in this territory the past week were less than 4000 tons. The new prices do not appear to have sharpened the interest of the pig iron buyer. No large inquiries are out, and lethargic conditions continue.

Prices per gross ton, f.o.b. furnace:

No. 2 fdy., sil. 1.75 to 2.25.....	\$17.00
No. 2X fdy., sil. 2.25 to 2.75.....	17.50
No. 1 fdy., sil. 2.75 to 3.25.....	18.50
Malleable, sil. up to 2.25.....	17.50
Basic.....	17.00
Lake Superior charcoal.....	25.25

FINISHED STEEL

The Lackawanna plant of the Bethlehem Steel Co. is operating 14 open-hearth, with the possibility of 15 being active by the end of the week. Operations at the Republic Steel Corp. are unchanged at three furnaces; Wickwire Spencer is operating three, and Gould Coupler one. A new warehouse for Loblaw Groceterias, Inc., will require 500 tons of rail steel.

OLD MATERIAL

The market is quiet, though the largest consumer is reported to have purchased a small tonnage of No. 1 and No. 2 heavy melting steel at \$10 and \$8.50 respectively. Shipments of scrap are slowing up and prices are softening. A mill is understood to have paid the equivalent of the No. 1 heavy melting steel price for hydraulic compressed sheets on shipments from Detroit, though it will pay only the quoted price on dealers' bundles.

Sheet Prices Under New Classification

The new base prices for sheet mill products, under the new classification, are now being quoted by some mills on new business and are to take full effect, it is announced, on third quarter contracts. The base prices are as follows:

Per Lb., Pittsburgh

Hot-rolled, No. 10 gage.....	1.70c.
Hot-rolled annealed, No. 24.....	2.40c.
Heavy cold-rolled, No. 10.....	2.35c.
Cold-rolled, No. 20.....	2.95c.
Automobile body sheets, No. 20.....	3.10c.
Heavy furniture sheets, No. 10.....	2.75c.
Light furniture sheets, No. 20.....	3.35c.
(Prices on furniture stock include stretcher leveling but not resquaring)	
Galvanized sheets, No. 24.....	2.90c.
Long ternes, unassorted, No. 24.....	3.15c.

Usual differential over Pittsburgh base prices of \$2 a ton applies on all of these grades at Chicago district mills.

Warehouse Prices, f.o.b. Buffalo

	Base per Lb.
Plates and struc. shapes.....	3.25c.
Soft steel bars.....	3.15c.
Reinforcing bars.....	2.95c.
Cold-fin. flats and sq.....	3.65c.
Rounds and hex.....	3.15c.
Cold-rolled strip steel.....	5.85c.
Black sheets (No. 24).....	4.20c.
Galv. sheets (No. 24).....	4.60c.
Bands.....	3.50c.
Hoops.....	3.90c.
Blue ann'd sheets (No. 10).....	3.50c.
Com. wire nails, base per keg.....	\$2.60
Black wire, base per 100 lb.....	3.20

Dealers are now assembling material such as old automobile fenders and old sheet scrap into what is known as No. 2 hydraulic compressed sheets, on which the current quotation is \$8, delivered.

Prices per gross ton, f.o.b. Buffalo consumers' plants:

Basic Open-Hearth Grades:	
No. 1 heavy melting steel.....	\$10.00 to \$10.50
No. 2 heavy melting scrap.....	8.50 to 9.00
Scrap rails.....	10.00 to 10.50
Hydraul. comp. sheets.....	8.50 to 9.00
No. 2 hydraul. comp. sheets.....	8.00
Hand bundled sheets.....	8.00 to 8.50
Drop forge flashings.....	8.50 to 9.00
No. 1 busheling.....	8.50 to 9.00
Hvy. steel axle turnings.....	8.50 to 9.50
Machine shop turnings.....	4.50 to 5.00
No. 1 railroad wrought.....	9.00 to 9.50
Acid Open-Hearth Grades:	
Knuckles and couplers.....	12.00 to 12.50
Coil and leaf springs.....	12.00 to 12.50
Roller steel wheels.....	12.00 to 12.50
Low phos. billet and bloom ends.....	13.00 to 14.00
Electric Furnace Grades:	
Short shov. steel turnings.....	6.00 to 6.50
Blast Furnace Grades:	
Short mixed borings and turnings.....	6.00 to 6.50
Cast iron borings.....	6.00 to 6.50
No. 2 busheling.....	6.00
Rolling Mill Grades:	
Steel car axles.....	15.00 to 15.50
Iron axles.....	16.00 to 16.50
Cupola Grades:	
No. 1 machinery cast.....	10.00 to 10.50
Stove plate.....	8.00 to 8.25
Locomotive grate bars.....	7.00 to 7.50
Steel rails, 3 ft. and under.....	13.00 to 13.50
Cast iron carwheels.....	11.50 to 12.00
Malleable Grades:	
Industrial.....	10.50 to 11.00
Railroad.....	10.50 to 11.00
Agricultural.....	10.50 to 11.00
Special Grades:	
Chemical borings.....	9.00 to 9.50

Erie City Iron Works, Erie, Pa., has appointed the following sales representatives: Pittsburgh—Thomas O. Schrader, Jr., 716 Investment Building; Duluth, Minn.—A. H. Kennedy, 316 Glencoe Building; Los Angeles—C. W. Kennecott, 800 Santa Fe Street.

C. J. Tagliabue Mfg. Co., Brooklyn, manufacturer of indicating, recording and controlling instruments, has opened a branch sales office at 2832 East Grand Boulevard, Detroit. H. W. Kerr is in charge.

▲▲ Semi-Finished Steel, Raw Materials, Bolts and Rivets ▲▲

MILL PRICES OF SEMI-FINISHED STEEL

Billets and Blooms	
	Per Gross Ton
Rerolling, 4-in. and under 10-in., Pittsburgh	\$29.00 to \$30.00
Rerolling, 4-in. and under 10-in., Youngstown	29.00 to 30.00
Rerolling, 4-in. and under 10-in., Cleveland	29.00 to 30.00
Rerolling, 4-in. and under 10-in., Chicago	31.00 to 32.00
Forging quality, Pittsburgh	35.00 to 36.00

Sheet Bars	
	Per Gross Ton
(Open-Hearth or Bessemer)	
Pittsburgh	\$29.00 to \$30.00
Youngstown	29.00 to 30.00
Cleveland	29.00 to 30.00
Slabs	
	Per Gross Ton
(8 in. x 2 in. and under 10 in. x 10 in.)	
Pittsburgh	\$29.00 to \$30.00
Youngstown	29.00 to 30.00
Cleveland	29.00 to 30.00

Skelp	
	Per Lb.
(F.o.b. Pittsburgh or Youngstown)	
Grooved	1.65c.
Universal	1.65c.
Sheared	1.65c.
Wire Rods	
	Per Gross Ton
(Common soft, base)	
Pittsburgh	\$35.00
Cleveland	35.00
Chicago	35.00

PRICES OF RAW MATERIAL

Ores	
	Per Gross Ton
Lake Superior Ores, Delivered Lower Lake Ports	
Old range Bessemer, 51.50% iron	\$4.80
Old range non-Bessemer, 51.50% iron	4.65
Mesabi Bessemer, 51.50% iron	4.65
Mesabi non-Bessemer, 51.50% iron	4.50
High phosphorus, 51.50% iron	4.40

Foreign Ore, c.i.f. Philadelphia or Baltimore	
	Per Unit
Iron ore low phos., copper free, 55 to 58% iron in dry Spanish or Algeria	.8c. to 9c.
Iron ore, low phos., Swedish, average 68% iron	10.00c.
Iron ore, basic or foundry, Swedish, average 65% iron	9.00c.
Manganese ore, washed 52% manganese, from the Caucasus	25c. to 27c.
Manganese ore, African or Indian, 50 to 52% iron	24c. to 26c.
Manganese ore, Brazilian, 46 to 48% iron	22c. to 24c.
Tungsten ore, high grade, per unit, in 60% concentrates	\$12.00 to \$12.50
Per Gross Ton	
Chrome ore, 45% Cr ₂ O ₃ crude, c.i.f. Atlantic seaboard	\$20.00
Chrome ore, 48% Cr ₂ O ₃ crude, c.i.f. Atlantic seaboard	22.50

Coke	
	Per Net Ton
Furnace, f.o.b. Connellsville prompt	\$2.40
Foundry, f.o.b. Connellsville prompt	\$3.25 to 4.75
Foundry, by-product, Ch'go ovens	7.50
Foundry, by-product, New England, del'd	11.00
Foundry, by-product, Newark or Jersey City, delivered	9.00 to 9.40
Foundry, by-product, Phila.	9.00
Foundry, Birmingham	5.00
Foundry, by-product, St. Louis, f.o.b. ovens	8.00
Foundry, by-product, del'd St. Louis	9.00

Coal	
	Per Net Ton
Mine run steam coal, f.o.b. W. Pa. mines	\$1.40 to \$1.50
Mine run coking coal, f.o.b. W. Pa. mines	1.40 to 1.50
Gas coal, 1/2-in., f.o.b. Pa. mines	1.70 to 1.80
Mine run gas coal, f.o.b. Pa. mines	1.50 to 1.60
Steam slack, f.o.b. W. Pa. mines	75c. to 85c.
Gas slack, f.o.b. W. Pa. mines	1.00 to 1.10

Ferromanganese	
	Per Gross Ton
Domestic 80% seaboard	\$80.00 to \$85.00
Foreign, 80% Atlantic or Gulf port, duty paid	*80.00 to 85.00

*Minimum price quoted for lots of 2000 tons or more.

Spiegeleisen	
	Per Gross Ton Furnace
Domestic, 19 to 21%	\$28.00 to \$30.00
Electric Ferrosilicon	
	Per Gross Ton Delivered
50%	\$83.50
75%	130.00
Per Gross Ton	
	Furnace
10%	\$35.00
11%	37.00
Per Gross Ton	
	Furnace
12%	\$39.00
14 to 16%	39.00

Bessemer Ferrosilicon	
	Per Gross Ton
F.o.b. Jackson County, Ohio, Furnace	
10%	\$25.00
11%	26.00
12%	27.00
Per Gross Ton	
	Furnace
13%	\$29.00
14%	31.00
15%	33.00

Silvery Iron	
	Per Gross Ton
F.o.b. Jackson County, Ohio, Furnace	
6%	\$19.00 to \$21.00
7%	19.50 to 21.50
8%	20.00 to 22.00
9%	20.50 to 22.50
10%	21.00 to 23.00
11%	\$22.00 to \$24.00
12%	23.00 to 25.00
13%	25.00 to 27.00
14%	27.00 to 29.00
15%	29.00 to 31.00

Delivered prices at Chicago are about 50c. a ton below this schedule.

Other Ferroalloys	
	Per Lb. contained metal
Ferrotungsten, per lb. contained metal	\$1.08
Ferrotungsten, less carloads	\$1.15 to 1.25
Ferrocromium 4 to 6% carbon and up, 65 to 70% Cr., per lb. contained Cr. delivered, in carloads	11.00c.
Ferrocromium, 2% carbon	17.00c. to 17.50c.
Ferrocromium, 1% carbon	19.00c. to 20.00c.
Ferrocromium, 0.10% carbon	24.50c. to 26.00c.
Ferrocromium, 0.06% carbon	26.50c. to 28.00c.
Ferrovandium, per lb. contained vanadium, f.o.b. furnace	\$3.15 to \$3.65
Ferrocobaltitium 15 to 18%, per net ton, f.o.b. furnace, in carloads	\$160.00
Ferrophosphorus, electric or blast furnace material, in carloads, 18%, Rockdale, Tenn., base per gross ton	91.00
Ferrophosphorus, electric, 24%, f.o.b. Anniston, Ala., per gross ton	122.50
Silico-manganese, gross ton, delivered	135.00

Fluxes and Refractories

Fluorspar	
	Per Net Ton
Domestic, 85% and over calcium fluoride, not over 5% silicon, gravel, f.o.b. Illinois and Kentucky mines	\$14.00
No. 2 lump, Illinois and Kentucky mines	17.00
Foreign, 85% calcium fluoride, not over 5% silicon, c.i.f. Atlantic port, duty paid	17.00
Domestic, No. 1 ground bulk, 95 to 98% calcium fluoride, not over 2 1/2% silicon, f.o.b. Illinois and Kentucky mines	32.50

Fire Clay Brick	
	Per 1000 f.o.b. Works
	High-Heat Intermediate Duty Brick Heavy Duty Brick
Pennsylvania	\$40.00 to \$43.00 \$32.00 to \$35.00
Maryland	40.00 to 43.00 32.00 to 35.00
New Jersey	40.00 to 43.00
Ohio	40.00 to 43.00 32.00 to 35.00
Kentucky	40.00 to 43.00 32.00 to 35.00
Missouri	40.00 to 43.00 32.00 to 35.00
Illinois	40.00 to 43.00 32.00 to 35.00
Ground fire clay, per ton	6.50

Silica Brick	
	Per 1000 f.o.b. Works
Pennsylvania	\$45.00
Chicago	49.00
Birmingham	47.00
Silica clay, per ton	8.00

Magnesite Brick	
	Per Net Ton
Standard sizes, f.o.b. Baltimore and Chester, Pa.	\$65.00
Grain magnesite, f.o.b. Baltimore and Chester, Pa.	40.00

Chrome Brick	
	Per Net Ton
Standard size	\$45.00

MILL PRICES OF BOLTS, NUTS, RIVETS AND SET SCREWS

Bolts and Nuts	
	Per Cent Off List
(F.o.b. Pittsburgh, Cleveland, Birmingham or Chicago)	
Machine bolts	.73
Carriage bolts	.73
Lag bolts	.73
Plow bolts, Nos. 1, 2, 3 and 7 heads	.73
Hot-pressed nuts, blank or tapped, square	.73
Hot-pressed nuts, blank or tapped, hexagons	.73
C.p.c. and t. square or hex. nuts, blank or tapped	.73
Washers*	7.00c. to 6.75c. per lb. off list

*F.o.b. Chicago, New York and Pittsburgh.
†Bolts with rolled thread up to and including 1/2 in. x 6 in. take 10 per cent lower list prices.

Bolts and Nuts	
	Per Cent Off List
Semi-finished hexagons nuts	.73
Semi-finished hexagons castellated nuts, S.A.E.	.73
Stove bolts in packages, P'gh	.80, 10, 10 and 5
Stove bolts in packages, Chicago	.80, 10, 10 and 5
Stove bolts in packages, Cleveland	.80, 10, 10 and 5
Stove bolts in bulk, P'gh	.80, 10, 10, 5 and 2 1/2
Stove bolts in bulk, Chicago	.80, 10, 10, 5 and 2 1/2
Stove bolts in bulk, Cleveland	.80, 10, 10, 5 and 2 1/2
Tire bolts	.60, 10 and 10

Discounts of 73 per cent off on bolts and nuts apply on carload business with jobbers and large consumers.

Large Rivets	
	Base per 100 Lb.
(1/2-in. and larger)	
F.o.b. Pittsburgh or Cleveland	\$2.75
F.o.b. Chicago	2.85

Small Rivets	
	Per Cent Off List
(7/8-in. and smaller)	
F.o.b. Pittsburgh	.70, 10 and 5
F.o.b. Cleveland	.70, 10 and 5
F.o.b. Chicago	.70, 10 and 5

Cap and Set Screws	
	Per Cent Off List
(Freight allowed up to but not exceeding 50c. per 100 lb. on lots of 200 lb. or more)	
Milled cap screws	.80, 10, 10 and 5
Milled standard set screws, case hardened	.80 and 5
Milled headless set screws, cut thread	.75 and 10
Upset hex. head cap screws, U.S.S.S. thread	.85 and 10
Upset hex. cap screws, S.A.E. thread	.85 and 10
Upset set screws	.80, 10 and 5
Milled studs	.70

Mill Prices of Finished Iron and Steel Products

Iron and Steel Bars

Soft Steel

	Base per Lb.
F.o.b. Pittsburgh mill.....	1.65c. to 1.70c.
F.o.b. Chicago.....	1.70c. to 1.80c.
Del'd Philadelphia.....	1.94c. to 1.99c.
Del'd New York.....	1.98c. to 2.03c.
F.o.b. Cleveland.....	1.65c. to 1.70c.
F.o.b. Lackawanna.....	1.75c. to 1.80c.
F.o.b. Birmingham.....	1.80c.
C.i.f. Pacific ports.....	2.25c.
F.o.b. San Francisco mills.....	2.25c.

Billet Steel Reinforcing

F.o.b. P'gh mills, 40, 50, 60-ft.....	1.60c. to 1.65c.
F.o.b. Birmingham, mill lengths.....	1.75c.
F.o.b. mills, east of Chicago dist.....	1.30c. to 1.35c.
F.o.b. Chicago Heights mill.....	1.60c. to 1.65c.
Del'd Philadelphia.....	1.84c. to 1.89c.

Rail Steel

F.o.b. mills, east of Chicago dist.....	1.30c. to 1.35c.
F.o.b. Chicago Heights mill.....	1.60c. to 1.65c.
Del'd Philadelphia.....	1.84c. to 1.89c.

Iron

Common iron, f.o.b. Chicago.....	1.70c. to 1.80c.
Refined iron, f.o.b. P'gh mills.....	2.75c.
Common iron del'd Philadelphia.....	2.09c.
Common iron, del'd New York.....	2.14c.

Tank Plates

Base per Lb.

F.o.b. Pittsburgh mill.....	1.65c.
F.o.b. Chicago.....	1.70c. to 1.80c.
F.o.b. Birmingham.....	1.80c.
Del'd Cleveland.....	1.83 1/2 c.
Del'd Philadelphia.....	1.85 1/2 c.
F.o.b. Coatesville.....	1.75c.
F.o.b. Sparrows Point.....	1.75c.
F.o.b. Lackawanna.....	1.75c.
Del'd New York.....	1.93c.
C.i.f. Pacific ports.....	2.05c.

Structural Shapes

Base per Lb.

F.o.b. Pittsburgh mill.....	1.65c.
F.o.b. Chicago.....	1.70c. to 1.80c.
F.o.b. Birmingham.....	1.80c.
F.o.b. Lackawanna.....	1.75c.
F.o.b. Bethlehem.....	1.75c.
Del'd Cleveland.....	1.83 1/2 c.
Del'd Philadelphia.....	1.76c.
Del'd New York.....	1.90 1/2 c.
C.i.f. Pacific ports.....	2.15c. to 2.25c.

Hot-Rolled Hoops, Bands and Strips

Base per Lb.

6 in. and narrower, P'gh.....	1.60c. to 1.65c.
Wider than 6 in., P'gh.....	1.50c. to 1.55c.
6 in. and narrower, Chicago.....	1.65c. to 1.75c.
Wider than 6 in., Chicago.....	1.55c. to 1.65c.
Cooperage stock, P'gh.....	1.80c. to 1.90c.
Cooperage stock, Chicago.....	1.80c. to 1.90c.

Cold-Finished Steel

Base per Lb.

Bars, f.o.b. Pittsburgh mill.....	2.10c.
Bars, f.o.b. Chicago.....	2.10c.
Bars, Cleveland.....	2.10c.
Bars, Buffalo.....	2.10c.
Shafting, ground, f.o.b. mill.....	2.45c. to 3.40c.
Strips, P'gh.....	2.15c. to 2.25c.
Strips, Cleveland.....	2.15c. to 2.25c.
Strips, deliv'd Chicago.....	2.43c.
Strips, Worcester.....	2.30c. to 2.40c.
Fender stock, No. 20 gage, Pittsburgh or Cleveland.....	3.20c.

*According to size.

Wire Products

(Carload lots, f.o.b. Pittsburgh and Cleveland)	
To Manufacturing Trade	
Bright wire.....	2.20c.
Spring wire.....	3.20c.

To Jobbing Trade

Base per Lb.

Smooth annealed wire.....	2.35c.
Smooth galvanized wire.....	2.80c.
Polished staples.....	2.35c.
Galvanized staples.....	2.60c.
Barbed wire, galvanized.....	2.55c.
Woven wire fence, per net ton.....	\$60.00

Base per Keg

Standard wire nails.....	\$1.80 to \$1.90
Smooth coated nails.....	1.80 to 1.90
Galvanized nails.....	3.80 to 3.90

To Retail Trade

Base per Lb.

Bright wire.....	2.30c.
Smooth annealed wire.....	2.40c.
Smooth galvanized wire.....	2.90c.

Base per Keg

Standard wire nails.....	\$2.00
Cement coated nails.....	2.00
Galvanized nails.....	4.00

Base per Lb.

Polished staples.....	2.45c.
Galvanized staples.....	2.70c.
Barbed wire galvanized.....	2.65c.
Woven wire fence per net ton.....	\$65.00

Anderson, Ind., mill prices are ordinarily \$1 a ton over Pittsburgh base; Duluth, Minn., and Worcester, Mass., mill \$2 a ton over Pittsburgh, and Birmingham mill \$3 a ton over Pittsburgh.

(Prices of sheet mill products under new classification on page 1711.)

Light Plates

Base per Lb.

No. 10, blue annealed, f.o.b. P'gh.....	1.85c.
No. 10, blue annealed, f.o.b. Chicago dist.....	1.95c.
No. 10, blue an'd, del'd Phila.....	2.14c. to 2.19c.
No. 10, blue annealed, B'ham.....	2.00c. to 2.05c.
No. 10, blue annealed, Pacific Coast ports.....	2.50c.

Sheets

Blue Annealed Base per Lb.

No. 13, f.o.b. P'gh.....	2.00c.
No. 13, f.o.b. Chicago dist.....	2.10c.
No. 13, del'd Philadelphia.....	2.29c.
No. 13, blue annealed, B'ham.....	2.15c.

Box Annealed, One Pass Cold Rolled

No. 24, f.o.b. Pittsburgh.....	2.15c. to 2.25c.
No. 24, f.o.b. Chicago dist. mill.....	2.35c.
No. 24, del'd Philadelphia.....	2.44c. to 2.54c.
No. 24, f.o.b. Birmingham.....	2.40c.
No. 24, c.i.f. Pacific Coast ports.....	3.00c.

Steel Furniture Sheets

No. 24, f.o.b. P'gh.....	3.40c. to 3.50c.
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Galvanized

No. 24, f.o.b. Pittsburgh.....	2.80c.
No. 24, f.o.b. Chicago dist. mill.....	2.90c.
No. 24, del'd Cleveland.....	2.98 1/2 c.
No. 24, del'd Philadelphia.....	3.24c.
No. 24, f.o.b. Birmingham.....	2.80c. to 2.90c.
No. 24, c.i.f. Pacific Coast ports.....	3.50c.

Continuous Mill Sheets

No. 10 gage.....	1.70c.
No. 13 gage.....	1.85c.

Tin Mill Black Plate

No. 28, f.o.b. Pittsburgh.....	2.55c. to 2.65c.
No. 28, f.o.b. Chicago dist. mill.....	2.65c. to 2.75c.

Automobile Body Sheets

No. 20, f.o.b. Pittsburgh.....	3.00c. to 3.10c.
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Long Terns

No. 24, 8-lb. coating, f.o.b. mill:	
Unassorted.....	3.15c.
Assorted.....	3.25c.
Primes only.....	3.35c.

Vitreous Enameling Stock

No. 10, Pittsburgh (carloads).....	3.10c.
No. 20, Pittsburgh (carloads).....	3.60c.

Tin Plate

Base per Box

Standard cokes, f.o.b. P'gh district mills.....	\$5.00
Standard cokes, f.o.b. Gary.....	5.10

Terne Plate

(F.o.b. Morgantown or Pittsburgh)

(Per Package, 20 x 28 in.)

8-lb. coating I.C. \$10.30	25-lb. coating I.C. \$15.20
15-lb. coating I.C. 12.80	30-lb. coating I.C. 16.00
20-lb. coating I.C. 14.00	40-lb. coating I.C. 17.80

Alloy Steel Bars

(F.o.b. maker's mill)

Alloy Quantity Bar Base, 2.45c. to 2.65c. per Lb.	
S.A.E. Series	
Numbers	Differential
2000 (1 1/2% Nickel).....	\$0.25
2100 (1 1/2% Nickel).....	0.55
2300 (3 1/2% Nickel).....	1.50
2500 (5% Nickel).....	2.25
3100 Nickel Chromium.....	0.55
3200 Nickel Chromium.....	1.35
3300 Nickel Chromium.....	3.80
3400 Nickel Chromium.....	3.20
4100 Chromium Molybdenum (0.15 to 0.25 Molybdenum).....	0.50
4100 Chromium Molybdenum (0.25 to 0.40 Molybdenum).....	0.70
4600 Nickel Molybdenum (0.20 to 0.30 Molybdenum, 1.25 to 1.75 Nickel).....	1.05
5100 Chromium Steel (0.60 to 0.90 Chromium).....	0.35
5100 Chromium Steel (0.80 to 1.10 Chromium).....	0.45
5100 Chromium Spring Steel.....	0.20
6100 Chromium Vanadium Bar.....	1.20
6100 Chromium Vanadium Spring Steel.....	0.95
9250 Silicon Manganese Spring Steel (flats).....	0.25
Rounds and squares.....	0.50
Chromium Nickel Vanadium.....	1.50
Carbon Vanadium.....	0.95

Above prices are for hot-rolled steel bars, forging quality. The differential for cold-drawn bars is 3/4 c. a lb. higher, with standard classification for cold-finished alloy steel bars applying. For billets 4 x 4 to 10 x 10 in., the price for a gross ton is the net price for bars of the same analysis.

Billets under 4 x 4 in. carry the steel bar base. Slabs with a sectional area of 16 in. or over carry the billet price. Slabs with sectional area of less than 16 in. or less than 2 1/2 in. thick, regardless of sectional area, take the bar price.

Rails

Per Gross Ton

Standard, f.o.b. mill.....	\$43.00
Light (from billets), f.o.b. mill.....	34.00
Light (from rail steel), f.o.b. mill.....	32.00
Light (from billets), f.o.b. Ch'go mill.....	36.00

Track Equipment

Base per 100 Lb.

Spikes, 3/4 in. and larger.....	\$2.70
Spikes, 1/2 in. and larger.....	2.70

Spikes, boat and barge.....	\$2.90
Tie plate, steel.....	1.95
Angle bars.....	2.75
Track bolts, to steam railroads.....	\$3.80 to 4.00
Track bolts, to jobbers, all sizes, per 100 count.....	73 per cent off list

Welded Pipe

Base Discounts, f.o.b. Pittsburgh District and Lorain, Ohio, Mills

Butt Weld

Inches	Steel	Black	Galv.	Inches	Iron	Black	Galv.
1 1/2	47	21 1/2	1 1/2 and 3/4	1 1/2	23	5	
1 3/4	53	27 1/2	1 3/4	1 3/4	28	11	
2	58	44 1/2	2	1 and 1 1/4	31	15	
2 1/2	62	50 1/2	2 1/2	2 1/2	35	18	
3	64	52 1/2	3				
3 1/2	64	52 1/2	3 1/2				
4	64	52 1/2	4				
4 1/2	64	52 1/2	4 1/2				
5	64	52 1/2	5				
5 1/2	64	52 1/2	5 1/2				
6	64	52 1/2	6				
6 1/2	64	52 1/2	6 1/2				
7	64	52 1/2	7				
7 1/2	64	52 1/2	7 1/2				
8	64	52 1/2	8				
8 1/2	64	52 1/2	8 1/2				
9	64	52 1/2	9				
9 1/2	64	52 1/2	9 1/2				
10	64	52 1/2	10				
10 1/2	64	52 1/2	10 1/2				
11	64	52 1/2	11				
11 1/2	64	52 1/2	11 1/2				
12	64	52 1/2	12				

Lap Weld

2	57	45 1/2	2	23	9
2 1/2	61	49 1/2	2 1/2	28	13
3	61	49 1/2	3	30	17
3 1/2	61	49 1/2	3 1/2	29	16
4	61	49 1/2	4	26	11

Butt Weld, extra strong, plain ends

1 1/2	43	26 1/2	1 1/2 and 3/4	+13	+56
1 3/4	49	32 1/2	1 3/4	23	7
2	55	44 1/2	2	28	12
2 1/2	60	49 1/2	2 1/2	34	18
3	62	51 1/2	3		
3 1/2	63	52 1/2	3 1/2		

Lap Weld, extra strong, plain ends

2	55	44 1/2	2	29	13
2 1/2	59	48 1/2	2 1/2	34	20
3	58	47 1/2	3	33	19
3 1/2	54	41 1/2	3 1/2	31	17
4	47	34 1/2	4	21	8
4 1/2	46	33 1/2	4 1/2		

On carloads the above discounts on steel pipe are increased on black by one point, with supplementary discounts of 5 and 5%, and on galvanized by 1 1/2 points, with supplementary discounts of 5%. On iron pipe, both black and galvanized, the above discounts are increased to jobbers by one point with supplementary discounts of 5 and 2 1/2%.

Note.—Chicago district mills have a base two points less than the above discounts. Chicago delivered base is 2 1/2 points less. Freight is figured from Pittsburgh, Lorain, Ohio, and Chicago district mills, the billing being from the point producing the lowest price to destination.

Boiler Tubes

Base Discounts, f.o.b. Pittsburgh

Steel	Charcoal Iron
2 in. and 2 1/4 in.....	38
2 1/2 in.—2 3/4 in.....	46
3 in.....	52
3 1/2 in.—3 3/4 in.....	54
4 in.....	57
4 1/2 in. to 6 in.....	46
1 1/2 in.....	1
1 3/4 in.....	8
2 in.—2 1/4 in.....	13
2 1/2 in.—2 3/4 in.....	16
3 in.....	17
3 1/2 in. to 3 3/4 in.....	18
4 in.....	20
4 1/2 in.....	21

On lots of a carload or more, the above base discounts are subject to a preferential of two fives on steel and of 10 per cent on charcoal iron tubes. Smaller quantities are subject to the following modifications from the base discounts:

Lap Welded Steel—Under 10,000 lb., 6 points under base and one five; 10,000 lb. to carload, 4 points under base and two fives. Charcoal Iron—Under 10,000 lb., 2 points under base; 10,000 lb. to carload, base and one five.

Standard Commercial Seamless Boiler Tubes

Cold Drawn

1 in.....	61
1 1/4 to 1 1/2 in.....	53
1 3/4 in.....	37
2 to 2 1/4 in.....	32
2 1/2 to 2 3/4 in.....	40
3 in.....	52
3 1/4 to 3 1/2 in.....	46
3 3/4 to 4 in.....	4

Reinforcing Steel

Awards and Inquiries in Lighter Volume

LETTINGS of reinforcing steel the past week totaled 5000 tons, compared with 6000 tons in the previous week. About 1400 tons will be used for college buildings in Alton, Ill., and 1000 tons for State highway bridges in Wisconsin. New projects call for 6400 tons, of which 1000 tons is for track elevation work in Chicago and 1200 tons for a waterworks in Louisville. Awards follow:

YORK, PA., 250 tons, reservoir for York Water Co., to Taylor-Davis Co.
CINCINNATI, 800 tons, Cincinnati Union Terminal Co., part of award on new passenger depot, to Pollak Steel Co.
STATE OF OHIO, 150 tons, road construction, to Jones & Laughlin Steel Corp.
SOUTH BEND, IND., 150 tons, dormitories at Notre Dame University, to Trueson Steel Co.
EVANSVILLE, IND., 100 tons, public library, to Laclede Steel Co.
STATE OF WISCONSIN, 1000 tons, 15 highway bridges, to Jones & Laughlin Steel Corp.
FOND DU LAC, WIS., 100 tons, hospital, to Olney J. Deard & Co.
ALTON, ILL., 1200 to 1500 tons, Principia College buildings, to Laclede Steel Co.
WINNETKA, ILL., 135 tons, New Trier High School, to Inland Steel Co.; previously reported to an unnamed bidder.
LAKE COUNTY, ILL., 400 tons, road reinforcement, to American System of Reinforcing.
LOS ANGELES, 200 tons, film laboratory, to an unnamed bidder.
LOS ANGELES, 200 tons, two wing additions to State Building, to an unnamed company.
LOS ANGELES, 100 tons, apartment building, Berendo Street, to an unnamed company.
TUCSON, ARIZ., 100 tons, Veterans Hospital building, to an unnamed bidder.

Reinforcing Bars Pending

Inquiries for reinforcing steel bars include the following:

BOSTON, 170 tons, Edison Electric & Illuminating Co. power house addition.
STATE OF NEW JERSEY, 150 tons, bridge in Boonton; James Baraldino & Son, Inc., Boonton, N. J., general contractors.
STATE OF NEW JERSEY, 240 tons, bridge in Bergen County.
STATE OF NEW YORK, 200 tons, armories at Kingston and Newburgh; bids May 29.
BROOKLYN, 600 tons, sewer for Borough of Brooklyn; bids opened May 20.
NEW YORK, 1000 tons, Queens anchorages on Tri-Borough Bridge; Arthur McMullen Co., Inc., low bidder on general contract.
PHILADELPHIA, 195 tons of bars and wire mesh, building at 1200 Market Street for Philadelphia Savings Fund.
BUFFALO, 500 tons, warehouse for Loblaws Groceries, Inc.
WASHINGTON, PA., 100 tons, tobacco warehouse.
LAKE ARTHUR, LA., 200 tons, bridge over Mergentau River; Douillet & Erwin, New Orleans, general contractors.
YPSILANTI, MICH., 150 tons, dam for Ford Motor Co.
YPSILANTI, 100 tons, sewage disposal plant.

ST. JOSEPH, MICH., 170 tons, filtration plant.
FLINT, MICH., 250 tons, Northern High School.
ELOISE, MICH., 300 tons, infirmary hospital for Wayne County.
CHICAGO, 100 tons, General Exhibit Building for Century of Progress Exposition.
CHICAGO, 1000 tons, track elevation work for Pennsylvania Railroad.
CHICAGO, 130 tons, field house for University of Chicago.
MASON CITY, IOWA, 100 tons, Post Office.
LOUISVILLE, KY., 1200 tons, waterworks.
ST. LOUIS, 270 tons, Woerner Public School.
SACRAMENTO, 113 tons, bridge over Santa Ana River near Newport Beach; bids opened.
SACRAMENTO, 268 tons, bridge over Santa Clara River in Ventura County; bids May 27.
PASADENA, CAL., 300 tons, three laboratories for California Institute of Technology; bids being taken.

Industry Needs Stimulus of New Ideas—Kettering

It isn't mechanization, but stagnation of ideas that has brought industry to its present low state, declared Charles F. Kettering, president, General Motors Research Corp., Detroit, in an address at a meeting of the Detroit section of the American Society of Mechanical Engineers on May 14 at which the Great Lakes Steel Corp. was welcomed to Detroit. Mr. Kettering asserted that the reason people are not buying products today is that industry is not offering them anything new. This is the direct result of the mania in recent years for standardization of everything. Most automobiles look alike, thanks to standardization, and the same is true of other articles. One of the chief causes leading to the present slump was that during the heyday of prosperity management said, "Now, boys, everything is going along splendidly. Don't change anything." Industrial leaders fell into the rut of thinking that markets are indefinitely elastic.

The hardest thing today, said Mr. Kettering, is to sell an idea. Everybody is sitting around waiting for the glorious days of 1929 to come back, when they actually will not return. American industry apparently has the conception that all useful ideas have been put into practice and that everything is going to be the same for the next 100 years. This is a dangerous and untenable belief. Mr. Kettering emphasized that he is not opposed to a reasonable amount of standardization of materials, but is opposed to standardization of ideas.

Wherever one sees the sign "standardization" hung over a door, said Mr. Kettering, if he will look on the other side he will find the legend, "This is the home of cut-throat competition and no profit."

If changes were made in products when developments indicated that they were needed, there would never be

overproduction of goods which consumers do not want. This is one reason why a ball and chain sometimes should be put on the production manager who gets the manufacturing processes working so smoothly that he does not like to see them disturbed. This reluctance to swing into changes when there is yet little or no indication of a slackening in demand for a product is just as prevalent in the automobile industry as elsewhere and in large measure has been responsible for overproduction of cars in the past.

In addition to Mr. Kettering's remarks there were addresses of welcome to the Great Lakes company by E. S. Evans, president, Detroit Board of Commerce; A. C. Marshall, vice-president, Detroit Edison Co.; and S. Wells Utley, president, Michigan Manufacturers' Association. F. W. Manker replied on behalf of Great Lakes. The dinner was preceded by an afternoon inspection trip of the Great Lakes plant and a morning session at which Julius A. Clauss, chief engineer, Great Lakes Steel Corp., read a paper describing the new plant. Will H. Baltzell, chief engineer, Canadian Steel Corp., read a paper at this session on the present status of the Ojibway, Ont., plant of the Canadian company.

New Company to Make Special Wires and Dies

The American Alloy Co. has bought the property and equipment of Thomas Hamilton's Sons Co., 1340 East Berks Street, Philadelphia, and the wire drawing equipment of the American Mond Nickel Co. at Clearfield, Pa., and will engage in the manufacture of special wire products such as are used in electrical household heating devices, electrical measuring instruments, incandescent lamps and electric furnaces, and also will make tungsten carbide tipped tools, wire drawing dies, tube mill dies and welding rods. The tungsten carbide materials are all outside the scope of the Carboloy and Widia patents, it is stated.

M. L. Murray, founder of the Alloy Metal Wire Co., Moore, Pa., is president of the company. Francis A. Harris, formerly associated with the National-Harris Wire Co., Newark, N. J., is vice-president and production manager. Dr. F. M. Bennett, who for many years was superintendent and in charge of the laboratory for Queen & Co., now Gray Instrument Co., Philadelphia, manufacturer of electrical measuring instruments, is the electrical and mechanical engineer.

Blaw-Knox Co., Pittsburgh, has acquired the exclusive sales and manufacturing rights of the "Ateco" line of earth-moving machinery from the American Tractor & Equipment Co., Oakland, Cal., for the United States east of the Rocky Mountains and for all other countries.

FABRICATED STRUCTURAL STEEL

New Projects of 52,500 Tons Include 30,000-Ton Bridge in Kentucky—Awards Only 16,000 Tons

NEW fabricated structural steel projects are 52,500 tons. In this week's total, the foremost project is a 30,000-ton bridge over the Ohio River at Henderson, Ky., for the Louisville & Nashville Railroad. Other projects include grade crossing elimination at South Bend, Ind., for the New York Central Railroad, 3000 tons, and a bridge, over the Santa Clara River near Sacramento, Cal., 2000 tons. From 30 to 50 barges inquired for by Pittsburgh coal companies and the Standard Oil Co. of Kentucky will require 5500 to 9000 tons of steel.

Awards, at 16,000 tons, were among the smallest this year. About 1000 tons is in a bridge at Grafton, Pa., for the Pennsylvania Railroad. Awards follow:

North Atlantic States

BOSTON, 500 tons, City Hospital building, to Boston Structural Co.
BOSTON, 277 tons, Boston Elevated Railway Lincoln Wharf power house addition, to New England Structural Co.
BOSTON, 250 tons, Morton Street bridge, to American Bridge Co.
BOSTON, 150 tons, Charlestown school, to New England Structural Co.
SOUTHBORO-FRAMINGHAM, MASS., 430 tons, State highway bridge, to McClintic-Marshall Corp.
PROVIDENCE, R. I., 300 tons, telephone exchange, to a local fabricator.
EVERETT, MASS., 200 tons, New England Fuel & Transportation Co. coal mixing plant, to Wellman Engineering Co.
TOWNSEND, MASS., 155 tons, school, to a New Hampshire fabricator.
STATE OF MASSACHUSETTS, 800 tons, bridge from Deerfield to Greenfield, Mass., to American Bridge Co.
NIAGARA FALLS, N. Y., 250 tons, building for R & H Co., to Lackawanna Steel Construction Co.
TROY, N. Y., 340 tons, highway bridge, to American Bridge Co.
PINE VALLEY, N. Y., 400 tons, bridge for Pennsylvania Railroad, to American Bridge Co.
PORT HENRY, N. Y., 350 tons, State highway bridge, to American Bridge Co.
NEW YORK, 350 tons, East River Savings Bank building, to McClintic-Marshall Corp.
NEW YORK, 500 tons, hospital on Staten Island, to a local fabricator.
GRAFTON, PA., 1000 tons, bridge for Pennsylvania Railroad, to McClintic-Marshall Corp.
CAMDEN, N. J., 800 tons, Post Office, to Shippers Car Line Corp., Milton, Pa.
WASHINGTON, 100 tons, National Capitol Press building, to Jones & Laughlin Steel Corp.

The South

STATE OF GEORGIA, 150 tons, highway bridge for Wilkes and McDuffey Counties, to McClintic-Marshall Corp.
FORT WORTH, TEX., 500 tons, addition to Fort Worth Terminal station, to Fort Worth Structural Steel Co.
FORT WORTH, 250 tons, express depot at Texas & Pacific Railway station, to North Texas Iron & Steel Co.

Central and Northwest

BRIDGEPORT, MICH., 280 tons, bridge for State Highway Department, to American Bridge Co.
OAKWOOD, MICH., 845 tons, grade crossing separation for Wabash Railroad, to American Bridge Co.
JOLIET, ILL., 450 tons, telephone exchange, to Gage Structural Steel Co.

STATE OF ILLINOIS, 675 tons, highway bridges; 195 tons in Christian County, to Clinton Bridge Co.; 250 tons in LaSalle County, to Worden-Allen Co.; 230 tons in Williamson County, to Vincennes Bridge Co.
CHICAGO, 300 tons, boiler house for Swift & Co., to McClintic-Marshall Corp.
CHICAGO, 100 tons, Fisk Street station of Commonwealth Edison Co., to Vierling Steel Works.
CHICAGO, 200 tons, church at Eighty-first and Wood Streets, to New City Iron Works, local.
NILES CENTER, ILL., 170 tons, Petrolager Laboratories, to Gage Structural Steel Co.
WINNETKA, ILL., 800 tons, New Trier High School, to New City Iron Works, Chicago; previously reported to an unnamed bidder.
ROCK ISLAND RAILROAD, 170 tons, bridge, to McClintic-Marshall Corp.
STATE OF MINNESOTA, 100 tons, highway bridge, to Minneapolis-Moline Power Implement Co.
ST. PAUL, MINN., 750 tons, Cardozo Building, to St. Paul Foundry.
STATE OF NORTH DAKOTA, 170 tons, four highway bridges, to Illinois Steel Bridge Co.
OMAHA, NEB., 345 tons, White River bridge, to Petroleum Iron Works.

Western States

SALT LAKE CITY, 1000 tons, plates, 30 and 36-in. welded steel pipe; general contract to Morrison-Knudsen Co., sub-contract for pipe to an unnamed bidder.
LOS ANGELES, 750 tons, Southern California Edison Co. building, to Emsco Derrick & Equipment Co.
LOS ANGELES, 500 tons, two additional wings for State Building, to Consolidated Steel Corp.
OAKLAND, CAL., 175 tons, warehouse for Port Commission, to Herrick Iron Works.
SACRAMENTO, 650 tons, Kress building, to Minneapolis-Moline Power Implement Co.
SACRAMENTO, 303 tons, bridge over Eel River at Dyerville, to an unnamed bidder.
SACRAMENTO, 198 tons, bridge over Clear Creek in Shasta County, to an unnamed bidder.
PORTLAND, ORE., 300 tons, Cape Creek bridge, to an unnamed bidder.
SEATTLE, 120 tons, light ornamental iron work for Ford plant, to Wallace Bridge & Structural Steel Co.

STRUCTURAL PROJECTS PENDING

Inquiries for fabricated steel work include the following:

North Atlantic States

WORCESTER, MASS., 310 tons, art museum wing.
BOYLSTON, MASS., 300 tons, sanitarium, nurses' home, etc.
BOSTON, 200 tons, Jamaica Plain warehouse for Boston Consolidated Gas Co.
BOSTON, 100 tons, city charity administration building.
WISCASSET, ME., 665 tons, highway bridge over Sheepscott River.
STATE OF NEW YORK, 1000 tons, armories at Newburgh and Kingston, readvertised for bids, May 29.
NEW YORK, 300 tons, gymnasium for New York University at University Avenue and 180th Street.
TEANECK, N. J., 125 tons, highway bridge.
NEW YORK, 750 tons, apartment building at Amsterdam Avenue and 113th Street for Herman Axelrod.
NEWARK, N. J., 100 tons, highway bridge.
Linde-Griffith Construction Co., general contractor.
ROCHESTER, N. Y., 1000 tons, sheet steel piling; bids taken May 27.
PITTSBURGH, 1650 to 1980 tons, 10 to 12 barges for Island Creek Coal Co.
PITTSBURGH, 1500 to 2250 tons, 10 to 15 barges for Ohio River Coal Co.
ERIE, PA., 250 tons, Hamot Hospital.
WASHINGTON, 300 tons, plates, two floating derricks, one for Mare Island and one for San Diego; English Construction Co., Washington, low bidder.

The South

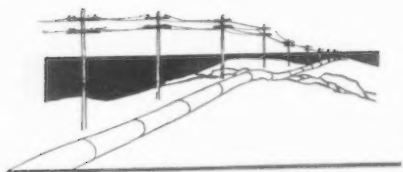
NEW ORLEANS, 58,000 tons, bridge across Mississippi River for New Orleans Public Railway. Pending revision of plans, bids, which were to have been opened June 4, have been postponed indefinitely.
CLARKSBURG, W. VA., 500 tons, Court House.
HENDERSON, KY., 30,000 tons, bridge over Ohio River for Louisville & Nashville Railroad.
STANDARD OIL CO. OF KENTUCKY, 2400 to 4800 tons, 10 to 20 barges.

Central States

SOUTH BEND, IND., 3000 tons, New York Central grade crossing elimination.
GENEVA, OHIO, tonnage unstated, grade crossing elimination for New York Central.
TOLEDO, 600 tons, Wabash and Nickel Plate grade crossing elimination.
NICKEL PLATE RAILROAD, tonnage unstated, five bridges.
CLEVELAND, 500 tons, County hospital.
CLEVELAND, 500 tons, city infirmary.
STATE OF WISCONSIN, 700 tons, highway bridge.
CHICAGO, 300 tons, additional steel for Fine Arts Building.
ALTON, ILL., 200 tons, Principia College buildings.
YPSILANTI, MICH., 800 tons, dam for Ford Motor Co.
DETROIT, 300 tons, store building for Richmond Brothers Co.
CHICAGO, 130 tons, 14 hotels in various Michigan cities for Autohaven Co.
GRAND RAPIDS, MICH., 100 tons, office building.
OLIVET, MICH., 225 tons, girls' dormitory and power house.

Western States

SACRAMENTO, 1715 tons and 304 tons H-columns, bridge over Santa Clara River in Ventura County; bids May 27.
SEATTLE, 110 tons, plates, two standpipes; bids to be called at once.
OAKLAND, CAL., 700 tons, Post Office.
STATE OF CALIFORNIA, 450 tons, highway bridges.



PIPE LINES

Sun Oil Co. Places 20,000 Tons For East Texas Line

OUTSTANDING awards of pipe for oil and gas lines are 20,000 tons by the Sun Oil Co. for a line in east Texas and 12,000 tons by the Columbia Gas & Electric Co. Details of the week's developments in the pipe line field are as follows:

Sun Oil Co. has placed an order for 198 miles of 10 $\frac{3}{4}$ -in. seamless pipe, involving about 20,000 tons of steel, with the Jones & Laughlin Steel Corp., Pittsburgh. Line is to run from East Texas field, and company has not yet received shipping instructions.

North Central Gas Co. has leased a portion of the old Teapot Dome pipe line in Wyoming and Nebraska, following the abandonment of its plans to lay a new line in that location. Approximately 750 tons of 2, 3 and 4-in. electric welded pipe has been bought from the Republic Steel Corp. for use in gathering lines in connection with this project.

MacArthur Concrete Pile Co. has or-

dered 250,000 ft. of 10-in. lapweld pipe from the Jones & Laughlin Steel Corp., for use in the Cincinnati Union Railroad Terminal project.

Columbia Gas & Electric Co. has placed an order for 12,000 tons of pipe for a gas line with the National Tube Co.

Sun Pipe Line, Inc., subsidiary of Sun Oil Co., has started work on a 6-in. gas-line pipe line to run from the New York State-Pennsylvania border to Syracuse, N. Y. Mitchell Stewart Construction Co., Pittsburgh, is general contractor. Completion of the line is called for by Aug. 15. Ford, Bacon & Davis, Inc., 39 Broadway, announce the completion of an oil pipe line from Longview, Tex., to Shreveport, La., for the Arkansas Pipe Line Co., a unit of the Cities Service Co. The main line is 70 miles long and has a capacity of 2500 bbl. a day.

Rio Grande Public Service Co., Rio Grande City, Tex., recently organized by F. A. Hornaday, Maverick Building, and associates, has closed contract with Los Olmos Oil & Gas Co. for gas supply from wells in oilfield district about eight miles from Rio Grande City, and plans early construction of main pipe line to city limits and distributing lines in city. It is proposed to extend system to Mission, Tex., and vicinity in near future.

Humble Oil & Refining Co., Houston, Tex., has construction under way on a pipe line for oil service from Carey Lake oilfield, 12 miles from Jacksonville, Tex., to a point near Arp, Tex., about 37 miles. Contract recently was let to Oklahoma Construction Co.

Hackensack Water Co., Weehawken, N. J., has awarded contract to T. A. Gillespie Co., New York, for water line

38,000 ft. long, to be constructed of $\frac{1}{2}$ -in. plate 52 in. inside diameter.

An order for 750 tons of electric welded steel pipe for the City of New York has been placed with Alco Products, Inc., a division of American Locomotive Co. The pipe, which is of 48-in. diameter, will be used for extensions to the water supply system in the Bronx. It will be fabricated in the plant of the American Locomotive Co., Dunkirk, N. Y.

Memphis Natural Gas Co. is in the market for 200 miles of 8 to 10-in. pipe, calling for 16,000 tons of steel.

Start Campaign Against Obsolescent Equipment

OLD POINT COMFORT, VA., May 19.—Impetus was given to a movement to bring about nation-wide modernization of industrial plants at the spring meeting of the National Machine Tool Builders' Association now in progress at the New Chamberlin Hotel. It was learned that through the initiative and stimulus of the officers of the association a plan now approaching completion is in the making that will focus the attention of business and industry in a fresh way on the problems of obsolescence. The plan won an enthusiastic reception. It appears that the Associated Business Papers, Inc., the trade association of business papers, has actively got behind the plan.

A campaign will be launched to point out emphatically the wisdom of replacing existing equipment by new machines of unquestioned economic value and incidentally improving the employment situation. The Associated Business Papers have appointed a committee which will soon issue the results of the study in concise form, following its approval by a large number of industrial and business leaders of national prominence. The study promises to establish that mechanization, instead of affecting employment adversely, actually serves to swell it.

Further Weakness in Scrap at Detroit

DETROIT, May 19.—Heavy melting steel and hydraulic bundles, as well as a number of other scrap items, have declined 25c. a ton. Little interest is being shown by consumers. The local steel plant is not expected to be in the market for at least another 30 days.

Dealers' buying prices per gross ton, f.o.b. cars, Detroit:

Hvy. melting and shov.	
steel	\$7.75 to \$8.25
Borings and short turnings	3.75 to 4.25
Long turnings	3.00 to 3.50
No. 1 machinery cast	8.25 to 8.75
Automotive cast	11.00 to 11.50
Hydraul. comp. sheets	7.00 to 7.50
Stove plate	6.25 to 6.50
New No. 1 busheling	6.50 to 7.00
Old No. 2 busheling	2.50 to 3.00
Sheet clippings	4.25 to 4.75
Flashings	6.50 to 7.00

TEXAS-CHICAGO GAS LINE, 960 MILES, NEARS COMPLETION

Final work is being done on the Texas-Chicago gas pipe line, which is expected to be completed about July 1. Soon after Chicago housewives will be cooking with natural gas transported from the Amarillo field, about 960 miles away. The digging machine shown in the illustration has been used to make ditches 6 ft. deep and 2 ft. wide, in which the gas pipe has been laid.



▲▲▲ Non-Ferrous Metal Markets ▲▲▲

Copper Lower—Tin Weak—Lead Steady— Zinc Higher

NEW YORK, May 19.

COPPER

Effective yesterday, Copper Exporters, Inc., reduced its quotation from 9.52½c. to 9.27½c., c.i.f. usual European ports, this being the second reduction within a week. As a result, there was heavy buying yesterday by foreign consumers, the total for the day having been about 3000 tons. Today the market was much quieter. Foreign sales for the month thus far have been about 17,000 gross tons. The reduction in the export price brings the domestic quotation of primary producers down to the same level as that of custom smelters which has prevailed for several weeks, or 9c., delivered in the Connecticut valley. Both primary and custom smelters are at present active participants in foreign and domestic sales. A fair amount of domestic business is being booked. Lake copper is quiet and lower at 9c. to 9.12½c., delivered.

TIN

Announcement was made yesterday that the result of the meeting at The Hague of the International Tin Producers Association was a decision to curtail output up to 33 per cent as contrasted with the present curtailment of 22 per cent. The result of the new plan is estimated to reduce the total world output to 125,000 tons a year, compared with the present one of 145,000 tons and a 1929 output of 188,280 tons. The immediate result of the announcement was an advance in prices yesterday both here and in London, but today prices again receded. It is thought by some that the curtailment is yet insufficient. Attempts today in this market to sell tin at prices lower than those of yesterday met with very little response. Consumers show no interest, and it is strongly believed that they are in an overbought condition. They have been buyers on the way down with very little increase in business. Yesterday the London market was up £4 5s., but today was down £2 15s., with spot standard quoted at £106 17s. 6d., future standard at £108 5s. and spot Straits at £109. The Singapore market today was £110 2s. 6d. Spot Straits tin today was quoted in New York at 23.50c., with very little business reported.

THE WEEK'S PRICES. CENTS PER POUND FOR EARLY DELIVERY

	May 19	May 18	May 16	May 15	May 14	May 13
Lake copper, New York.....	9.12½	9.12½	9.37½	9.37½	9.37½	9.37½
Electrolytic copper, N. Y.*.....	8.75	8.75	8.75	8.75	8.75	8.75
Straits tin, spot N. Y.....	23.50	24.10	23.30	23.30	23.30	23.25
Zinc, East St. Louis.....	3.35	3.35	3.35	3.35	3.35	3.35
Zinc, New York.....	3.70	3.70	3.70	3.70	3.70	3.70
Lead, St. Louis.....	3.60	3.60	3.60	3.60	3.60	3.60
Lead, New York.....	3.75	3.75	3.75	3.75	3.75	3.75

*Refinery quotation; price ¼c. higher delivered in the Connecticut Valley.

LEAD

Prices have remained unchanged for a week at 3.75c., New York, or 3.60c., St. Louis. Demand has been light and confined to carload and small lots, mostly for early delivery. There is considerable agitation for a reduction in output. There has still been no large buying of June metal.

ZINC

Sales of 4500 to 5000 tons last week, coupled with no pressure to sell by producers, raised the quotation for prime Western zinc to 3.35c., East St. Louis, for early delivery, at which level it has remained for several days. Galvanizing demand is very light and,

since the spurt last week, the market has been very quiet. There were some sales as high as 3.40c., East St. Louis, the middle of last week. One factor in the advance is reported to be an attempt by one or two smelters, who had sold zinc at 3.25c., to cover their requirements of ore with considerable difficulty. The feature of the ore market is the firmness of prices, which have stood at \$20 for several weeks, with buyers able to procure only a portion of their needs.

ANTIMONY

Although statistics for April were favorable, there has been some desire to sell, and Chinese metal is quoted

New York, Chicago or Cleveland Warehouse

Delivered Prices, Base per Lb.

High brass.....	16.25c.
*Copper, hot rolled, base sizes.....	18.87½c.
Seamless Tubes—	
Brass.....	19.25c.
Copper.....	21.37½c.
Brass Rods.....	14.50c.
Brazed Brass Tubes.....	24.87½c.

*Extra for cold-rolled, 3c. per lb.

New York Warehouse

Delivered Prices, Base per Lb.

Zinc sheets (No. 9),	9.00c. to 9.50c.
casks.....	10.00c. to 10.50c.
Zinc sheets, open.....	10.00c. to 10.50c.

Metals from New York Warehouse

Delivered Prices, per Lb.

Tin, Straits pig.....	25.00c. to 26.00c.
Tin, bar.....	27.00c. to 28.00c.
Copper, Lake.....	10.50c. to 11.00c.
Copper, electrolytic.....	10.25c. to 10.75c.
Copper, casting.....	10.00c. to 10.50c.
Zinc, slab.....	4.50c. to 5.50c.
Lead, American pig.....	4.75c. to 5.75c.
Lead, bar.....	6.75c. to 7.75c.
Antimony, Asiatic.....	9.00c. to 10.00c.
Aluminum No. 1 ingots	
for remelting (guar-	
anteed over 99% pure).....	24.00c. to 25.00c.
Alum. ingots, No. 12	
alloy.....	23.00c. to 24.00c.
Babbitt metal, commercial	
grade.....	25.00c. to 35.00c.
Solder, ½ and ½.....	18.00c. to 19.00c.

Metals from Cleveland Warehouse

Delivered Prices, per Lb.

Tin, Straits pig.....	27.50c.
Tin, bar.....	29.50c.
Copper, Lake.....	10.75c.
Copper, electrolytic.....	10.75c.
Copper, casting.....	9.75c.
Zinc, slab.....	5.50c.
Lead, American pig.....	4.90c. to 5.00c.
Lead, bar.....	7.75c.
Antimony, Asiatic.....	10.00c.
Babbitt metal, medium grade.....	15.00c.
Babbitt metal, high grade.....	31.50c.
Solder, ½ and ½.....	19.00c.

Old Metals, Per Lb., New York

Buying prices represent what large dealers are paying for miscellaneous lots from smaller accumulators and selling prices are those charged consumers after the metal has been properly prepared for their uses.

	Dealers' Buying Prices	Dealers' Selling Prices
Copper, hvy. crucible	7.00c.	7.75c.
Copper, hvy. and wire	6.75c.	7.50c.
Copper, light and bot-		
oms.....	5.75c.	6.50c.
Brass, heavy.....	3.75c.	4.75c.
Brass, light.....	3.25c.	4.25c.
Hvy. machine compo-		
sition.....	5.75c.	6.75c.
No. 1 yel. brass turn-		
ings.....	4.25c.	4.75c.
No. 1 red brass or		
compos. turnings.....	5.25c.	6.00c.
Lead, heavy.....	2.50c.	3.00c.
Zinc.....	1.25c.	1.75c.
Sheet aluminum.....	10.00c.	12.00c.
Cast aluminum.....	5.00c.	7.50c.

today a little lower at 6.50c. a lb., New York, duty paid, with futures about 10 points lower.

NICKEL

Electrolytic cathodes are quoted at 35c. a lb., with shot and ingot nickel made from remelted electrolytic at 36c. a lb. for single lots of spot metal.

ALUMINUM

Virgin metal, 98 to 99 per cent pure, is obtainable at the published price of 22.90c. a lb., delivered.

Urge Freight Reduction on New England Scrap

The importance of lower freight rates in the scrap iron industry was discussed at a meeting of the southern New England division of the Institute of Scrap Iron and Steel, Inc., in New Haven, Conn., May 14. Examples were given to show that many sources of material are drying up on account of high freight rates. It was stated that, while the price for borings and turnings in southern New England is approximately \$1.30 a ton, it requires \$5.70 freight per ton to move the scrap to the Pittsburgh market. The traffic bureau of the institute was requested to negotiate for a reduction of the rate structure in New England, similar to the general reduction in freight rates, which was recently effected from points in the metropolitan district in New York to eastern Pennsylvania.

Protest Against Pig Iron Rates from South

WASHINGTON, May 19.—Thirteen companies in Pennsylvania, New York and Massachusetts operating 22 blast furnaces with an aggregate annual capacity of 3,147,000 gross tons of pig iron, have filed a joint brief with the Interstate Commerce Commission protesting against reduced rates on pig iron from Southern producing points to New England and Eastern Trunk Line territories. Most of the protesting furnace interests, which have been joined by the Bethlehem Steel Co., are located along the Atlantic Seaboard. A brief of like character also has been filed by carriers in Eastern Trunk Line and New England territories.

The reduced rates were put into effect early in 1929 and previously by Southern railroads and steamship lines. The Northern blast furnace interests ask for restoration of rates prevailing before reductions were made. It is charged that the present rates are unduly low and unlawful.

Contention is made that the rates have given the Southern furnaces such a position in the Northern market that "they have utterly demoralized it as to prices and unnecessarily thrown

heavy loss on Northern furnaces and carriers." It is claimed that from 150,000 to 200,000 tons of Southern pig iron annually comes into the Northern markets. Under normal conditions, the brief filed by the Northern furnace interests says, the consumption of merchant pig iron in the Northern markets involved is approximately 1,000,000 tons annually as an outside figure. Since the reduced Southern rates became effective, according to the brief, the total iron used has been about 800,000 tons a year.

The former and present rail-and-water rates (per gross ton) from Birmingham, with the reductions, are presented in the brief as follows:

To	Former	Present	Reduction
Baltimore	\$5.76	\$5.00	\$0.76
Philadelphia	6.01	5.25	0.76
New York	6.37	5.50	0.87
Providence, R. I.	6.91	5.75	1.16
Boston	6.91	5.75	1.16

The Northern furnaces declared that they do not ask rates on pig iron from Birmingham and other Southern points which will exclude it from the North Atlantic Seaboard.

"They ask no more than rates from the South which will permit all producers, North and South, to have a fair basis of competition in that market," the brief says. "They ask that such rates be determined on the basis of transportation conditions and by lawful standards established in the (Interstate Commerce) act, and not upon any purpose to equalize commercial opportunities."

Lake Cargo Coal Rate Held to Be Fair

WASHINGTON, May 12.—Dismissal of the Lake cargo coal case is recommended in a proposed report by Examiner C. M. Bardwell made last week to the Interstate Commerce Commission. Passing upon complaints by operators of mines in eastern Ohio and western Pennsylvania, the examiner held that rates on coal to Lake

Erie ports for transshipment to the Northwest are not unduly prejudicial or unduly preferential.

The complaining operators sought a wider spread in the rates from their mines over those from the so-called Southern mines, particularly those in West Virginia. The basic differential is 35c. in favor of the Pittsburgh district, with a rate of \$1.46 a ton against a rate of \$1.81 applying from the high volatile Southern districts.

Industrial Coal Stocks Lowest Since 1922

WASHINGTON, May 15.—Stocks of bituminous coal at steel works on April 1 averaged 29 days' supply against 30 days on Feb. 1, according to the Bureau of Mines, while supplies at by-product coke plants decreased to 26 days from 33 days. Gas coal supplies at steel works on April 1 remained unchanged at 37 days, while stocks of steam coal were reduced to 24 days from 26 days. Low volatile supplies at by-product plants on April 1 declined to 34 days from 45 days and high volatile supplies decreased to 24 days from 30 days.

Commercial stocks used largely for industrial purposes amounted to 29,500,000 tons on April 1. In comparison with the amount on hand at the beginning of the previous quarter, this was a decrease of 7,700,000 tons and is the smallest tonnage in storage for any period on record since 1922. During the past 12 months consumers' stocks have been reduced by 3,600,000 tons.

Continental Roll & Foundry Co., including the Duquesne Steel Foundry division, the Hubbard Steel Foundry division, and the Wheeling Mold & Foundry division, has removed its Pittsburgh offices from the Union Bank Building to 2105 Grant Building.

PIG IRON SHIPPED FROM BLAST FURNACES IN THE UNITED STATES, 1929-1930, BY STATES

(Figures compiled by United States Bureau of Mines)

State	1929		1930	
	Gross Tons	Value	Gross Tons	Value
Alabama	2,697,814	\$43,674,910	2,294,513	\$31,083,905
Colorado	(a)	(a)	(a)	(a)
Illinois	4,316,096	79,672,295	3,050,743	54,290,144
Indiana	4,279,825	71,416,732	3,195,517	52,869,137
Kentucky	194,150	(a)	85,328	(a)
Maryland	1,111,219	(a)	981,466	(a)
Massachusetts	(a)	(a)	(a)	(a)
Michigan	841,089	14,099,647	711,224	12,859,820
Minnesota	376,551	(a)	266,622	(a)
New Jersey	204	(a)	405	(a)
New York	2,626,771	46,960,186	1,638,323	29,160,895
Ohio	9,446,984	163,480,003	6,541,212	111,529,209
Pennsylvania	14,058,194	257,154,601	9,734,591	176,521,843
Tennessee	104,985	1,938,238	42,197	828,716
Utah	(a)	(a)	(a)	(a)
Virginia	44,512	(a)	50,629	(a)
West Virginia	653,048	(a)	704,654	(a)
Undistributed	5797,719	53,461,463	5607,931	543,021,463
	41,549,161	731,858,075	29,905,355	512,165,131

^a Included under "Undistributed."

^b Includes figures for States entered as "(a)" above.

Open-Hearth Men Talk Over Their Operating Problems

(Concluded from page 1686)

roof and rings, to a depth of 2½ to 3½ in. This was put on piecemeal while the furnace was running.

"It was found difficult to heat this furnace up successfully after a shut-down, because of a tendency of the roof to buckle and come down. However, the first helper learned how to do it through watching his roof more closely. Radiation loss on the furnace was much less than before. The insulation was really tried out of curiosity to see whether a furnace could be run successfully with an insulated roof. The management is now convinced that furnace roofs should be insulated.

Safety and Employee Relations

TWO general topics under the heading of "Organization" were discussed by representatives of three companies. Safety was taken up by men from the Inland Steel Co. and the Wisconsin Steel Co., while the council plan of employee representation at the Wisconsin Steel Co. and at the American Rolling Mill Co. were described.

On the subject of safety, the hot-metal hazard was considered the greatest of any in the plant, and the crane hazard second. The opinion was expressed that the attitude of the employees all the way down the line has a great deal to do with the success of safety measures. The interest must start at the head of the organization.

Open-hearth fatalities are more numerous, both actually and in proportion, than those in any other part of steel mill operation. [See THE IRON AGE, March 12, page 859.] This situation has not yielded so well to safety efforts as have most of the other departments. With only 6 per cent of the employees, the open-hearth department has 20 per cent of the fatalities, and severe accidents are most common in this department. Open-hearth lost-time accidents in a recent analysis were shown to average about 23½ days of absence.

Foremen must investigate every accident, no matter how trivial, if improvement is to be made. One company found it expedient to administer discipline to any man responsible for an accident. Either time off without pay, or a change of occupation, or demotion might be applied. And it makes no difference if the man is on a salary.

To put it in figures, one plant reported 45 lost-time accidents and 306 minor accidents in 1927; 29 lost-time accidents and 343 minor accidents in 1928; 12 lost-time accidents and 285 minor accidents in 1929; and only 7 lost-time accidents and 219 minor accidents in 1930. The lost-time acci-

dents showed successive decreases of 36, 59 and 42 per cent.

Works Council Has Men Equally Represented

MEN and management were reported about equally represented on the works council of the Wisconsin Steel Co. Each department has its own group, elected by the men through secret ballot. Eligibility for voting and representation includes one year of continuous service.

Where cases cannot be settled by the council itself, they are referred to the president of the corporation. Should he fail to act on them within 10 days, they are submitted to a specified arbitration. In the several years during which this system has been in vogue, only three cases have been deadlocked, and hence referred to the president. None has been arbitrated.

Waste elimination is a part of the work undertaken by this council. The men are made to appreciate that reduction of waste increases profits, and thus gives them a better chance to participate in the earnings.

Employee representation has functioned satisfactorily here through several wage increases, and several wage decreases. The men work hand in hand with management and there must be a complete understanding between the two groups if the matter is to operate successfully.

Belief that the men are the most important of all the factors involved in manufacturing operations is at the basis of the Armco employee plan. Each department has its own committee and these committees together form the council as a whole.

Advisory committees are composed of one representative from each 30 employees in the larger departments, while some of the smaller departments are grouped together, with representation on about the same basis. A full year of continuous employment is necessary as part of the eligibility for membership on these committees or for voting for members. Voting is by secret ballot.

Alloy-Steel Dampers in Furnace Flues

SOME of the older types of furnace valves have as much as 25 tons of cast iron parts, without counting the weight of the refractories, according to a statement by a representative of the Ohio Steel Foundry Co. These heavy units require excessive power for operating, take much valuable space and a great deal of water cooling.

His company was reported to have installed 54 of its new alloy-steel dampers in 17 plants and to have shown a saving of heat through lack

of leakage. These operate satisfactorily at the temperature of the open-hearth flues, without water cooling.

Alloy-steel valves were said to save from 50 to 70 per cent in weight, and correspondingly in the labor of lifting them, thus permitting use of smaller motors. They eliminate cleaning costs and all the supply of water and the cost of treating and cooling the water. Having a 3-in. pad machined around the damper, they are said to give a better seal than the water-cooled damper.

A representative of the Blaw-Knox Co. reported on a valve of this type, made by his company, in which, after 623 heats, the greatest warpage was slightly less than ⅛ in. He expressed the opinion that the question boils down to just how much leakage it will be permissible to tolerate. While his company makes both dry dampers and those with water cooling, he believes that the dry damper has not necessarily solved this problem.

Handling Hot Metal

INTERMITTENT handling of hot pig iron, from the blast furnace through the mixer and to the open-hearth, is fast going out of date, according to one speaker. Operating men are coming to consider the question of keeping the hot metal all the time on wheels. The newer type ladles will hold metal for 10 or 12 hr. without a coke dust covering, and with very little loss of heat, and for still longer if coke dust or slag is used to blanket the metal. This ability comes partly from their shape and partly from the heavy refractory lining used.

Heretofore the blast furnace men have been responsible for the ladles delivering metal to the steel mill. Open-hearth men should and will have more say about the character of these ladles, because it is they who are interested in temperature losses.

These mixer-type ladles used in place of mixers have gone up to a capacity of 200 tons maximum. They were reported to have returned the money on the investment in from 18 to 24 months. Part of the saving comes from the reduction of scrap losses, because of the fact that there is no repouring between blast furnace and open-hearth.

If these ladles are to be thoroughly successful, blast furnace practice must be more dependable, and this it was reported to be becoming, yearly. The furnaces are making fewer off casts of iron. When an off cast is made, it will be run through the pig machine and used for another purpose. To take its place it may be necessary to charge cold iron into the open-hearth until another hot cast becomes available.

One company running two blast furnaces—one on basic iron and the other on foundry iron—is putting the latter through the pig machine. The same ladle handles the output from both furnaces. It is found that the foundry iron cleans out the small skulls resulting from the basic iron.

British Discuss Forming One Corporation to Control Entire Steel Industry

(By Cable)

LONDON, ENGLAND, May 18.

THE executive council of the Iron and Steel Trades Confederation, representing about 60,000 workers, has devised a plan for revival of the British iron and steel trade. This includes the establishment of a public utility corporation at an estimated cost of £10,000,000 to £30,000,000 (\$48,600,000 to \$145,800,000) to control and organize industry.

The plan also calls for trade agreements with other countries, regulation, restriction or prohibition of imports should circumstances justify, and fixing of domestic trade prices. Branch meetings of the Confederation were held over the week-end to consider the council's proposals, but decisions were not unanimous.

In the South Wales Tin Plate Corporation, the Morriston, Kidwelly and Western works have seceded from the Corporation and other withdrawals are possible. The future of the Corporation has not yet been determined, but it is believed that it will make selling agreements with only a few special groups of tin plate mills.

Pig iron demand is poor and Midland producers have reduced their domestic prices 2s. 6d. to 5s. (61c. to \$1.22) per ton. Cleveland makers are still declining to grant concessions except to Scottish users. The Ayresome works has blown in two blast furnaces on hematite to fill orders covering delivery over the next 10 to 12 weeks.

Public utility corporation to control entire steel industry proposed in Great Britain.

* * *

Soviet completes plans for Novo Tagilski Works to have annual capacity of 1,860,000 tons of open-hearth steel.

* * *

Government Works in Japan to increase tin plate capacity to 88,160 base boxes a month.

* * *

Chinese Government plans \$39,000,000 steel plant at Pukow with annual output of 150,000 tons.

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Finished steel markets are dull, with export business negligible and mills in need of shipyard specifications. Output, especially on the Northeast Coast, is now very low.

The market here for Continental material is dull, with but little interest among consumers. Prices have sagged as a result of a general decline in business and certain mills have withdrawn all quotations in the British market.

Tin plate is generally quiet. The Soviet has bought about 80,000 boxes and Continental consumers are buy-

ing moderately, but the total export business is insufficient to maintain prices, which are sagging as a result of efforts by some mills to maintain operations.

The general unrest among mills in the South Wales Tin Plate Corporation may lead to further price reductions, and abandonment of pooling production after June 13 appears to be almost certain.

Galvanized sheets are quiet in spite of the removal of the Australian embargo.

British exports in April included 13,000 tons of pig iron, of which the United States was sent 400 tons. Total iron and steel exports were 188,000 tons.

The Soviet trade delegation has announced placing orders for 30,000 tons of hematite iron with British Guest, Keen, Baldwins Iron & Steel Co. for immediate delivery.

Registrations have been made here of the Melingriffith (Argentine) Tin Plate Co. and the Melingriffith (Brazilian) Tin Plate Co., close corporations, each with capital of £1,000 (\$4,860). The companies are formed to acquire and hold, in accordance with the laws of Argentina and Brazil, tin plate or other manufacturing works.

The Frodingham Iron & Steel Co. is negotiating to purchase the Scunthorpe blast furnaces of the North Lincolnshire Iron Co., closed since July, 1930.

The Belgian La Providence works

British and Continental European Export Prices per gross ton, f.o.b. United Kingdom Ports, Hamburg and Antwerp with the £ at \$4.8665 (par)

British Prices, f.o.b. United Kingdom Ports

Ferromanganese, export.	£9 0s.	to £11 5s.	\$43.74 to \$54.75
Billets, open-hearth.	5 2½	to 5 10	24.91 to 26.76
Black sheets, Japanese specifications	10 5		49.82
Tin plate, per base box.	0 14½	to 0 15	3.52 to 3.65
Steel bars, open-hearth.	7 17½	to 8 7½	1.71 to 1.81
Beams, open-hearth.	7 7½	to 7 17½	1.60 to 1.71
Channels, open-hearth.	7 12½	to 8 2½	1.66 to 1.76
Angles, open-hearth.	7 7½	to 7 17½	1.60 to 1.71
Black sheets, No. 24 gage	8 10		1.84
Galvanized sheets, No. 24 gage	11 0		2.42

Continental Prices, f.o.b. Antwerp or Hamburg

Foundry iron, 2.50 to 3.00 per cent sil., 1.00 per cent and more phos.	£2 8s.	to £2 9s.	\$11.66 to \$11.90
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Billets, Thomas (nominal)	£3 5s.	to £3 7s.	\$15.80 to \$16.28
Wire rods, L.W.C., No. 5			
B.W.G.	5 2½	to 5 7½	24.94 to 26.15
P.-H. H-beam	6 0		29.20
Black sheets, No. 31 gage, Japanese	11 5	to 12 12	54.68 to 58.32
Steel bars, merchant.	3 13	to 3 14	Cents a Lb. 0.79 to 0.80
Beams, Thomas, British standard (nominal)	3 9	to 3 10	0.77 to 0.78
Channels, Thomas, American sections	5 12	to 5 14	1.24 to 1.26
Angles, Thomas, 4-in. and larger, over ¾-in. thick	3 13	to 3 14	0.79 to 0.80
Angles, Thomas, 3-in.	3 14	to 3 15	0.80 to 0.81
Hoops and strip steel over 6-in. base	4 7	to 4 8	0.94 to 0.95
Wire, plain, No. 8 gage	4 18½		1.08
Wire, barbed, 4-pt. No. 12 B.W.G.	£ 12½		1.90

has blown in its fifth Marchienne furnace.

The Chinese Government proposes to erect a State steel works at Pukow to cost £8,000,000 (\$38,880,000) and to have an annual capacity within three years of 150,000 tons.

French production in March was 775,000 tons of pig iron and 722,000 tons of raw steel. At the end of the month 133 furnaces were in blast. The French rolled steel output included 59,000 tons of railroad material, 70,000 ton of shapes, 24,000 tons of wire rods, 15,000 tons of drawn wire, 13,000 tons of special bars, 182,000 tons of merchant bars, 7000 tons of tin plate, 49,000 tons of sheets under 5 mm. and 30,000 tons of sheets 5 mm. and heavier.

Polish rail mills are negotiating with the International Rail Workers' Association seeking a basis for membership. Entry of the Japanese Government works as a member is considered impossible, as the Japanese terms are unacceptable.

Production of the U. S. S. R. in April was 313,000 tons of pig iron and 281,000 tons of steel, which was 77 and 72 per cent of the planned production.

Plans have been formulated for the erection at a cost of about 300,000,000 rubles of the Novo Tagilski Steel Works, with 6 blast furnaces, 22 open-hearth furnaces and an annual output of 1,775,000 tons of pig iron and 1,860,000 tons of open-hearth steel.

Construction of a car-building plant in the Urals has been started, first production from which is expected early in 1933.

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Leipzig Fair Stimulated Foreign Buying

LEIPZIG, GERMANY, May 4.—German exhibitors at the Leipzig Spring Fair this year, especially companies in the metal field, estimate that they received a total of 560,000,000 m. (\$133,840,000) worth of business from foreign buyers at the Fair. About 28,000 foreigners attended, of whom 1462 were from the United States, 176 from Canada and 2516 from Great Britain.

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Japan Seeks to Export Iron to United States

YOKOHAMA, JAPAN, April 18.—Pig iron producers in Japan have about 400,000 tons of iron in stock, equivalent to 10 months' requirements of domestic consumers. To reduce this surplus, efforts are being made to export some of this iron to the United States through a large Japanese trading company. Most of the sales from this stock are expected to be to foundries on the Pacific Coast.

British Federation Cites Steel Merger Progress

LONDON, ENGLAND, May 11.—In a recent public statement, the National Federation of Iron and Steel Manufacturers of Great Britain summarizes certain measures recently taken to improve the position of the steel industry, "in order that the constant repetition of charges of inefficiency may not come to be believed by those who have no means of knowing the truth."

The federation points out that wages, taxation, social charges, transport costs, capital charges and other costs in the industry are far heavier in Great Britain than on the Continent. It states that reorganization of the industry requires capital, only available when confidence is established, and existing conditions have destroyed confidence.

Reviewing what has been accomplished in the British steel industry, the federation statement points to the formation of the Iron and Steel Industrial Research Council to promote production economies. In Scotland, the Colville, Beardmore and Dunlop steel interests have been combined and production concentrated at the Colville works, and plans for further mergers to include producers in that entire section are being considered.

On the North East coast, Dorman, Long & Co. and Bolckow-Vaughan & Co. have merged, and there are negotiations at present for close working agreements with other interests in that area. In the Midland section, the United Steel Companies, Ltd., includes Steel, Peech & Tozer, Samuel Fox & Co., Daniel Doncaster & Sons, United Strip & Bar Mill, Workington Iron & Steel Co., Frodington Iron & Steel Co. and Appleby Iron & Steel Co.

In the Sheffield district the most recent amalgamation is that of John Brown & Co. and Thomas Firth & Sons, with the new organization planning a closer working agreement with the English Steel Corp'n. This latter company is a comparatively recent merger of the heavy steel departments of Vickers-Armstrong & Co. and Cammell, Laird & Co.

In Lancashire, the Lancashire Steel Corp'n. has been formed by the Partington Iron & Steel Co., Pearson & Knowles, Ltd., and the Wigan Coal & Iron Co. In South Wales, the heavy steel interests of Baldwins, Ltd., and Guest, Keen & Nettlefolds have been merged into the British Iron & Steel Co., and in the tin plate field, the Richard Thomas interests control about 50 per cent of the business.

These mergers of recent years are cited by the federation to show that the steel industry is fully alive to the advantages of large-scale production. In addition, the formation of the British Steel Export Association, including all makers of shipbuilding and structural material, is cited, and action of the federation itself in ex-

tending its constitution to permit membership of steel industries in the dominions is noted as a further forward step.

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Jugoslavia Buys Cable From Germany

COLOGNE, GERMANY, April 27.—The Felten & Guillaume works here has signed a preliminary contract with the Government of Yugoslavia for cable and wire totaling about \$15,000,000. The final contract awaits solution of long-term credits. A German cable works is reported to be planning the establishment of a cable manufacturing plant in Yugoslavia.

▲ ▲ ▲

Japan Increases Output of Tin Plate

YOKOHAMA, JAPAN, April 18.—The Seitetsu Jo (Government Works) plans to put new equipment in operation in July, which will increase its tin plate capacity to 400 metric tons (88,160 base boxes) a month.

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German Forging Shops to Advertise Abroad

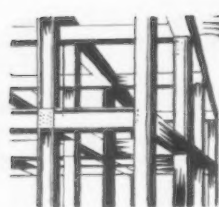
HAMBURG, GERMANY, April 29.—Forging shops, especially those producing forgings for machinery and motor car builders, have agreed to cooperate in seeking increased export business and will shortly begin a campaign of foreign advertising.

▲ ▲ ▲

Germany Develops Tin Plate Trade

BERLIN, GERMANY, May 5.—Development of tin plate export business is bringing orders to German mills from Japan, China, India, Canada, South Africa and certain South American countries. German quotations on tin plate compare favorably with Welsh prices, and recent sales have been at 15s. (\$3.65) a base box, f.o.b. port, with concessions offered on desirable orders.

As German extras for size are lower than the British, the mills have an advantage on special specifications, so that only a small portion of Germany's exports consists of cases containing 112 sheets 14 x 18 in. In markets where metric measurements are customary German mills have been furnishing 112 sheets 19 or 21 cm. x 100 cm. (7½ or 8¼ in. x 39½ in.) and 56 sheets 45 x 100 cm. (17¾ x 39½ in.).



PLANT EXPANSION AND EQUIPMENT BUYING



Machine Tool Trade at Low Point

April Orders Declined, According
to Report of National Machine Tool
Builders' Association

THE National Machine Tool Builders' Association's index for April confirms the reports that were received by THE IRON AGE during that month of a decline in machine tool orders. The association's index figure for last month's orders is 105.1, compared with 117.6 for March. There are indications in current reports of trade conditions that a further decline in orders will be reported for May.

It is remarked by the association that the April decline "is in line with seasonal activity." The largest falling off in orders was experienced by

smaller companies, which, incidentally, had the greatest rise in March.

The association's three-months' moving average advances to 102.1 from 89.4. A rise in the index of unfilled orders to 238 from 225.1 at the end of the previous month is due to the fact that the association did not receive identical reports from all of its members. Unfilled orders are about two and a half times current shipments for April.

Excepting at Chicago, where a fair volume of orders has been received from the Santa Fe Railroad and the International Harvester Co., the cur-

rent trade situation is decidedly discouraging. It probably will require a genuine improvement in general business to stimulate a demand for tools, and, considering this situation, the trade does not look for a gain of importance in the next few months.

Many manufacturers who admit they need new equipment or will need it when business has recovered have indefinitely postponed taking action on their requirements. This policy of rigid economy makes for an exceedingly slow market and a poor outlook until there is some decided change in the general business situation.



NEW YORK

Orders for machine tools have fallen off perceptibly in the past week, even when compared with the poor totals of the preceding weeks. Unless there is an unexpected improvement between now and the end of the month, May business in machine tools in this district will be decidedly smaller than that of April, which in turn declined as compared with March. Most of the trade refers to conditions as discouraging in view of the fact that many companies which a few months ago were believed to have purchases under consideration have indefinitely postponed action, the general disposition being to wait for something to happen.

MILWAUKEE

Machine tool sales the past week were of a scattering nature, and of relatively small aggregate. Inquiry, however, was fair, and covered a wide variety of shops. The picture as a whole is not particularly encouraging in view of the fact that it doubtless will require a genuine improvement in

general business to stimulate a demand for tools. The absence of new industrial construction is marked. However, modernization of shop equipment is slowly forging ahead and eventually will create demand. Meanwhile, the practice of rigid economy makes for a slow market.

CHICAGO

Machine tool sales, built on old inquiries, are turning upward, but the extent of the movement cannot be determined. The Santa Fe continues to place orders and International Harvester Co. has closed on about \$35,000 worth of tools and may buy more. Illinois Steel Co. is taking new bids on inquiries made last August.

PITTSBURGH

The expectation of seasonal dullness in most manufacturing lines during the summer has prompted many potential buyers to postpone purchases of machinery and other equipment even though existing facilities would be entirely inadequate for anything approaching a full operation. No orders for tools of importance have

been reported recently and new inquiry has dwindled materially. Existing inquiries also have been reduced by definite postponement of buying.

The market for heavy machinery and equipment is more active, although not much of this business is being discussed publicly. A Cleveland steel producer is reported to have placed a large mill with a Pittsburgh builder and other business of this sort is said to be in the offing.

CINCINNATI

The local machine tool market appears to be near a standstill. Orders have dwindled to the point where users only are taking care of their most urgent needs. Inquiries also are few.

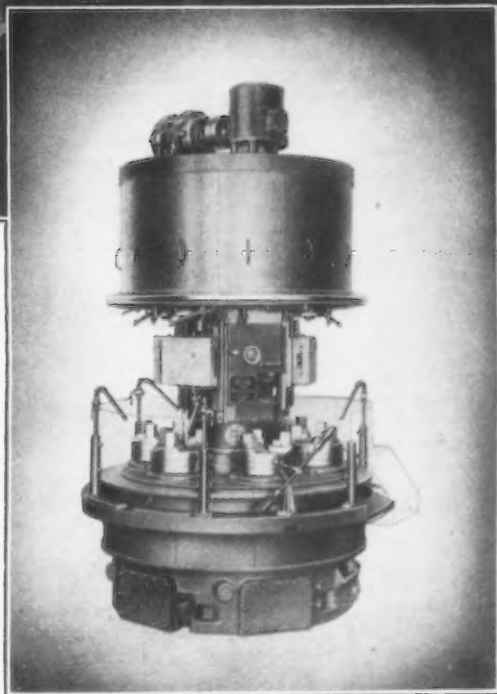
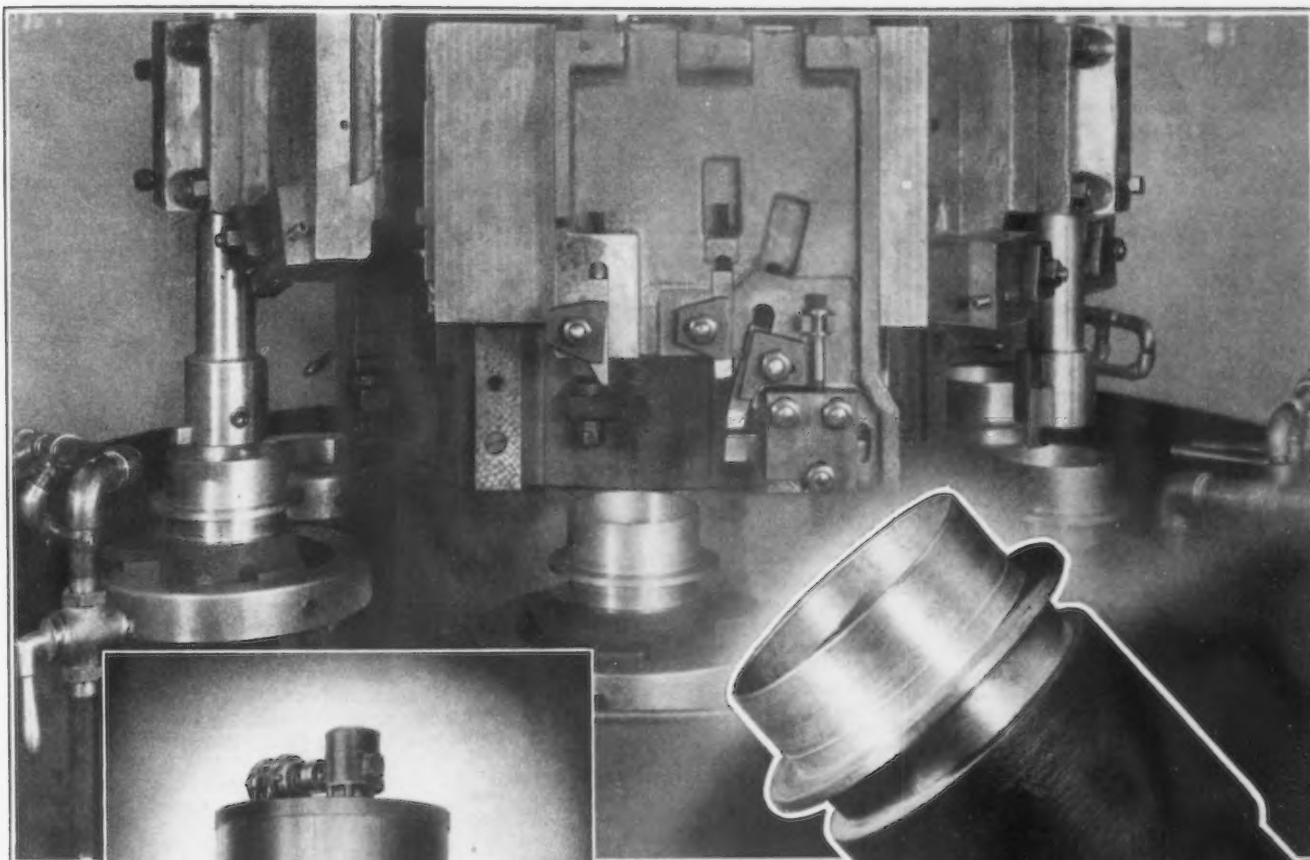
NEW ENGLAND

Manufacturers of equipment in this territory are, if anything, less employed and are operating with greatly depleted forces and on part time. Dealers' sales are few.

A falling off in small tool orders is reported, although shops in the Greater Boston district are holding up fairly well.

THE **BULLARD**

METHOD



Multiple Machining
Operations on Forged
Steel Airplane Engine
Cylinder



CONSISTENTLY maintained uniformity within close tolerance is imperative in the manufacture of airplane engine parts, particularly cylinders, heads, and cases.

Multi-Au-Matics are chosen for such jobs, because of their flexibility of tooling and adaptability to progressive changes in product design.

THE BULLARD COMPANY
Bridgeport Connecticut

New York

FUND of \$78,512,645 has been authorized by Consolidated Gas Co., 4 Irving Place, New York, for expansion and improvements in electric light and power, and gas properties in metropolitan district. Work will include new steam power plant for New York Steam Corp., 280 Madison Avenue, a subsidiary, to cost \$2,100,000 with equipment, and for extension and betterments in steam distributing lines and underground conduits to cost \$3,500,000. New York Edison Co. and Brooklyn Edison Co., affiliated interests, will use \$15,000,000 for extensions and improvements in electric generating plants and distributing lines; additional equipment will be installed in Hudson Avenue power plant of last noted. A further appropriation of \$20,000,000 has been made for both electric companies for changes in power lines from overhead to underground service. Parent organization has plans for a new water-gas generating plant at Hunts Point, to have daily capacity of 30,000,000 cu. ft. Company engineering department will be in charge of projects. Consolidated company has plans for a three-story equipment and mechanical shop on York Avenue, to cost over \$300,000 with equipment.

Matthew W. Del Gaudio, 545 Fifth Avenue, New York, architect, has filed plans for a five-story automobile service-repair and garage building, 50 x 180 ft., to cost about \$150,000 with equipment.

John B. Mezey, 102 West End Avenue, New York, operating an automobile repair and parts plant, has leased a floor in building at 402-16 East Ninety-first Street, for a new shop.

Salisbury Paper Products Co., Salisbury Mills, N. Y., recently organized by Laurence A. Barry, Jr., Salisbury Mills, and associates, with capital of \$150,000, has taken over former local paper mill and assets of Salisbury Mills, Inc. Improvements will be made in machinery, including replacements, etc., and mill placed in service. It is proposed to install paper converting division in fall. William H. Malone, Salisbury Mills, is interested in new organization.

Patrick J. Murray, 14 West Forty-fifth Street, New York, architect, has plans for a multi-story automobile service, repair and garage building, to cost over \$200,000 with equipment.

Bush Terminal Co., foot of Forty-third Street, Brooklyn, will carry out improvements at terminal warehouses, including installation of mechanical-handling, conveying and other equipment. Contract recently has been let for eight oil-electric locomotives for plant service. Entire program will cost over \$250,000, majority of fund to be used for equipment.

Board of Education, Rahway, N. J., plans installation of manual training equipment in new multi-story junior high school to cost \$480,000, for which plans are being drawn by Seymour Williams, 146 Irving Street, architect.

Officials of Public Service Electric & Gas Co., Terminal Building, Newark, have organized Newark Steam Co., a subsidiary, to establish a central steamheating system in downtown district. New company is considering erection of steam generating plant and will likely use present site of power substation on River Street for new unit; underground steam lines will be built. Initial program will cost over \$2,000,000.

Charles Shilowitz, 26 Journal Square, Jersey City, N. J., architect, has plans for a four-story automobile service, repair and garage building, 100 x 150 ft., to cost close to \$150,000 with equipment.

New Jersey Power & Light Co., Asbury Park, N. J., is planning a new high-tension transmission line from power station at South Amboy, N. J., to Sayreville, N. J., and vicinity. Steel towers will be used.

Stewart V. Briggs, 113 Essex Avenue, Bloomfield, N. J., and associates have organized Briggs Refinishing Co., and plan operation of metal plating works.

New York Telephone Co., 140 West Street, New York, is considering early call for bids for a multi-story equipment storage and distributing plant, with repair department, and automobile service and garage unit at Newark, to cost over \$700,000 with equipment. Structure will be used by New Jersey Bell Telephone Co., Newark. Voorhees, Gmelin & Walker, 101 Park Avenue, New York, are architects.

Board of Education, Englewood, N. J., plans installation of manual training equipment in new junior and senior high school on Knickerbocker Road, to cost \$800,000, for which bids on general contract are expected to be called during summer. Lawrence C. Light, 4 Dean Street, is architect.

Buffalo

CONTRACT has been let by Granger & Co., 135 Scott Street, Buffalo, wholesale grocer, to J. W. Cowper Co., Inc., Rand Building, for three-story storage and distributing plant, 100 x 140 ft., including conveying, elevating and other handling equipment, etc., to cost about \$100,000. George S. Rider Co., Marshall Building, Cleveland, is architect and engineer. Another company in same line, S. M. Flickinger Co., 79 Perry Street, has let contract to Cowper company for a two-story and basement storage and distributing plant, 150 x 160 ft., to cost \$125,000 with conveying and other mechanical-handling equipment.

Board of Public Works, City Hall, Rochester, N. Y., plans installation of electric pumping machinery and other power equipment in new water station, for which a fund of \$1,125,000 is being arranged.

Henry G. Griffith, 403 Ransom Avenue, Sherrill, N. Y., and associates have organized Griffith-Chamberlin, Inc., with capital of \$40,000 and headquarters at Oneida, N. Y., to operate a foundry at last-noted place for manufacture of stoves, furnaces, and parts. Frank W. Chamberlin, 417 Franklin Street, Oneida, will be an official of new company.

International Business Machines Corp., Endicott, N. Y., has secured exclusive manufacturing and distributing rights of Filene-Finlay translators, comprising a system of telephonic communication of multiple character for conventions and similar service, and will arrange production facilities at local plant for device, including parts and assembling. Company has plans for a four-story and basement addition, 50 x 56 ft., to cost about \$100,000 with equipment. Charles H. Higgins, 101 Park Avenue, New York,

is architect and engineer. Thomas J. Watson is president.

New England

AVIATION Committee, Chamber of Commerce, Hartford, Conn., James B. Simmon, chairman, has plans for a hangar at Brainard Field, 102 x 120 ft., with repair and reconditioning shop, 20 x 46 ft., to cost over \$60,000 with equipment. Isaac A. Allen & Son, Inc., 100 Farmington Avenue, is architect.

Welsh Mfg. Co., Providence, R. I., manufacturer of jewelry and plated ware, has taken over local Weybosset Mill of American Woolen Co., and will remodel for new factory.

Charles G. Allen Co., Inc., Barre, Mass., has been organized to take over and expand company of same name, with plant for manufacture of agricultural implements. New organization will also specialize in production of ball-bearing drilling machines, lathes and other machine tools. Charles A. Barton, 340 Main Street, Worcester, Mass., is president and treasurer.

American Writing Paper Co., Inc., Holyoke, Mass., has awarded general contract to Casper Ranger Construction Co., Holyoke, for mill extensions and improvements. Work will be carried out with program for electrification of considerable part of plant, to cost about \$100,000 with equipment.

Frigidaire Corp., Dayton, Ohio, manufacturer of electric refrigerating equipment, has leased four-story and basement building at 23 Blandford Street, Boston, totaling 52,000 sq. ft. floor space, for factory branch, service and sales units. Company is now maintaining offices at 743 Boylston Street.

Town Committee, Longmeadow, Mass., has awarded general contract to G. B. Owens, 67 Brunswick Street, Springfield, Mass., for one-story municipal repair and construction shop, 50 x 125 ft., with extension, 40 x 40 ft., to cost close to \$35,000 with equipment.

Town Committee, Spencer, Mass., is considering installation of manual training equipment in addition to high school to cost about \$160,000, for which plans are being drawn by Frost, Chamberlain & Edward, 390 Main Street, Worcester, Mass., architects.

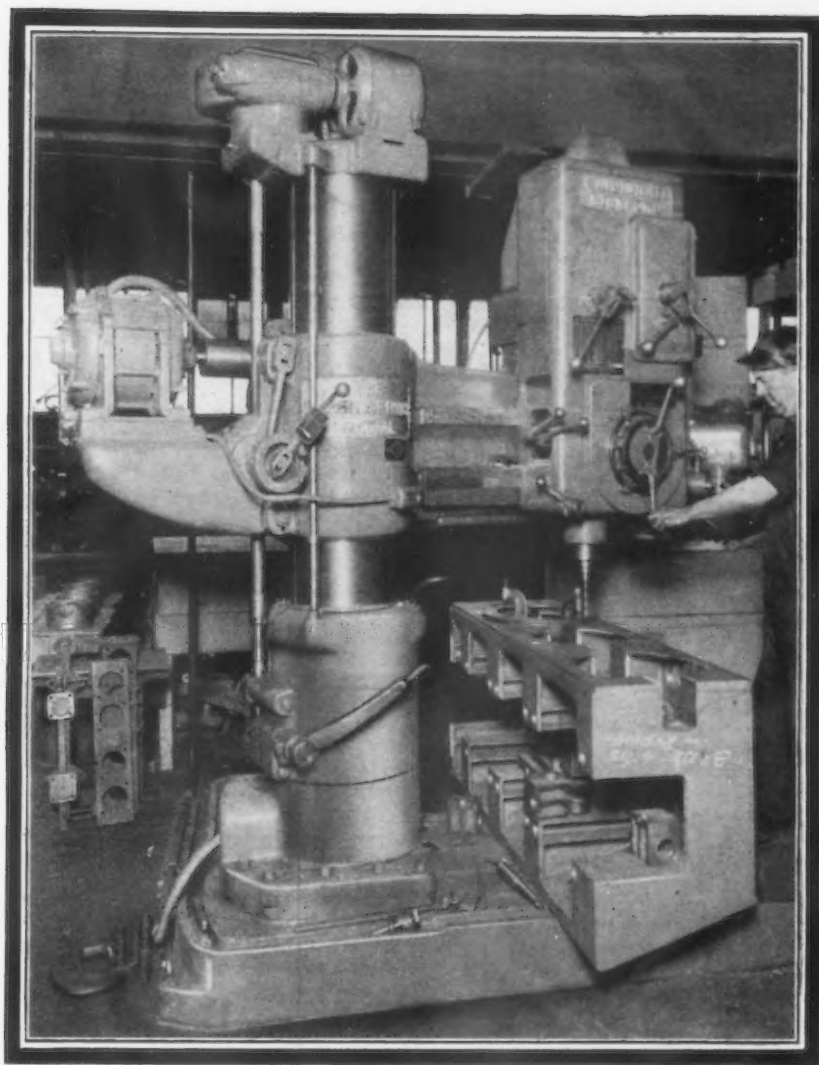
Eastern Massachusetts Street Railway Co., 38 Chauncy Street, Boston, will begin erection of a two-story double bus garage and service building at Melrose Highlands, to cost about \$100,000 with equipment. Basement will be equipped for a repair shop.

George H. Armitage, Jefferson Avenue, Hills Grove, R. I., has plans for an airplane manufacturing plant and hangar at Warwick, R. I.

Work has been started on a one-story press room addition by Panco Rubber Co., Chelsea, Mass. Motors and miscellaneous equipment, including a sanding machine, will be required.

Edward T. Chapin, 340 Main Street, Worcester, Mass., cutting dies, is erecting a plant addition. E. D. Ward Co., 82 Foster Street, is general contractor.

Sleeper & Hartley, Inc., Worcester, Mass., is building for Soviet Government complete equipment of spring coiling machinery to produce all types of coiled



DIESEL ENGINE FRAMES

Now Drilled in 9 Hours instead of 11

..... WITH THIS MODERN TOOL at the ATLAS
IMPERIAL DIESEL ENGINE CO., OAKLAND, CAL.

Formerly the drilling of the diesel engine frame, shown above, was handled on a "Scattered control" type of radial. To complete all the drilling operations required 11 hours. A new SUPER-SERVICE Radial effects a saving of 2 hours on each piece, by eliminating the time spent in walking around the work and from one end of the machine to the other for changing speeds. Its greater power and rigidity permits the use of faster speeds and heavier feeds.

Similar savings may be possible in your plant. You owe it to your company to investigate. Write for Booklet R-16 and check up on your old radial drills.

THE CINCINNATI BICKFORD TOOL CO., CINCINNATI, OHIO

The **SUPER ~ SERVICE** *Radial*

springs used in Russia in manufacture of automotive products, including motor trucks, airplanes and tractors. Machines are automatic and in all sizes. Thirty have been shipped and eight are now under construction.

Cleveland

PROPERTY on Park Street, Zanesville, Ohio, has been purchased by Zane Casting Co., Zanesville, as site for new foundry, machine shop, and general storage and distributing unit, to cost close to \$45,000 with equipment.

Sun Oil Co., 1608 Walnut Street, Philadelphia, has secured permission to construct a bulk storage and distributing plant at North Akron, Ohio, in connection with pipe line project in that district now under way. Plant will have an initial capacity of 600,000 gal., and will cost over \$85,000 with equipment. Company will also build a similar plant of 500,000-gal. capacity on 22-acre tract recently acquired at Cleveland, to cost close to like sum. A. S. Herpbringer is district manager at Akron.

Guardian Safe & Mfg. Co., Alliance, Ohio, care of Frank W. Andrews, Alliance Bank Building, recently organized, plans operation of factory for manufacture of safes, vaults and kindred steel products. Ira V. Fackler is one of heads of company.

West Ohio Gas Co., Lima, Ohio, has applied for permission to issue bonds for \$300,000, portion of fund to be used for extensions and improvements in plant and system.

Great Lakes Aircraft Corp., 16800 St. Clair Avenue, Cleveland, is planning to diversify its line of production and will soon begin manufacture of other specialties, including metal window frames and metal covers for steam radiators. Part of works will be arranged for these lines, with airplane manufacture continuing as heretofore.

South Atlantic

TREASURY Department, Washington, has engaged United Engineers & Constructors, Inc., 112 North Broad Street, Philadelphia, to prepare plans for new steam power plant for central heating service in Government buildings, to cost \$5,749,000. Project will include electric power substation for distribution of power to be secured from Potomac Edison Co.

American Oil Co., American Building, Baltimore, has acquired property of Jarvis Oil Co., Weston, Clarksburg and Fairmont, W. Va., including bulk oil storage and distributing plant, and will consolidate. Plans are under way for expansion, including additional oil storage and distributing facilities.

Board of District Commissioners, District Building, Washington, will receive bids until May 26 for one electric-driven centrifugal pumping unit for Bryant

Street pumping station, with capacity of 20,000,000 gal. a day.

Division of Purchases and Sales, Department of Commerce, Washington, will receive bids until June 1 for 2½-kw. engine-generator plants.

Jefferson Magisterial School District, Tazewell, Va., contemplates installation of manual training equipment in new high school, to cost about \$100,000, for which plans will be drawn by Raymond V. Long, Richmond, Va., architect for State Board of Education, Richmond.

Richmond Sandgravel Co., Augusta, Ga., recently organized by John G. Ehrlich, president of Southern Silica Mining & Mfg. Co., Augusta, and associates, plans installation of a new sand and gravel plant on 11-acre tract, with conveying, loading, screening and other equipment, to cost over \$35,000. John W. Wilson, one of heads of S. W. Wilson & Sons, Augusta, sand and gravel operator, will be vice-president.

Construction Quartermaster, Fort Monroe, Va., contemplates early call for bids for hangar unit, with repair facilities, at Langley Field, Hampton Roads, Va.

H. J. Heinz Co., 1062 Progress Street, Northside, Pittsburgh, will begin erection of one-story addition, 70 x 165 ft., to plant at Winchester, Va., equipped as a generator and operating unit, to cost about \$45,000 with machinery. General contract has been let to George F. Hazelwood, Howard Street, Cumberland, Md.

Campbell Metal Window Co., Bush and Hamburg Streets, Baltimore, has secured a contract for metal sash from Metropolitan Square Corp., New York, for new buildings in "Radio City," New York, totaling about \$1,000,000, and will develop maximum production for several months. Company is a subsidiary of American Radiator & Standard Sanitary Corp., New York.

Chicago

BLOCK of property on Western Avenue, from Thomas Street to Hadson Avenue, has been acquired by Commonwealth Edison Co., Chicago, as site for electric distributing plant. Structure will be built in two units, and contract for first unit, nine stories, 108 x 264 ft., has been let to Peterson Construction Co., Chicago. Second unit, for which contract will be let later, will be three stories, 73 x 231 ft. Entire plant will cost close to \$1,000,000 including equipment. H. V. Von Holst, 79 West Monroe Street, is architect.

Board of Education, Peoria, Ill., will install metal-working, electrical, automobile repair and other vocational shops in new two and three-story junior high school to cost about \$750,000 with equipment. It is expected to ask bids on general contract early in July. Hewitt, Emerson & Gregg, Peoria Life Building, are architects and engineers.

A. L. Randall Co., 729 South Wabash Avenue, Chicago, manufacturer of furniture, is planning to rebuild part of plant

recently destroyed by fire, with loss over \$500,000 including equipment.

United States Government Indian School, Wahpeton, N. D., is planning a one-story shop addition to cost about \$25,000 with equipment. Carl Stevens is superintendent, in charge.

City Council, Vermilion, S. D., has plans for a municipal electric light and power plant to cost about \$85,000 with equipment. Charles A. Trimmer, Madison, S. D., is consulting engineer.

Board of Education, Grand Forks, N. D., plans installation of manual training equipment in new two-story and basement junior high school to cost about \$200,000, for which bids will be asked soon on general contract. Wells & Ellis, First National Bank Building, are architects.

Binks Mfg. Co., 3124 Carroll Avenue, Chicago, manufacturer of spraying equipment, etc., is arranging for an increase in capital from 120,000 to 140,000 shares of stock, and for bond issue of \$300,000, part of proceeds to be used for plant extensions and improvements.

City Council, Pella, Iowa, has authorized an appropriation of \$45,000 for extensions and improvements in municipal electric light and power plant, including additional equipment.

Filing Devices, Inc., which has been operating as a partnership under name of Steel Transfer Case Co., has been incorporated at Aurora, Ill., to manufacture steel filing cabinets, transfer cases, card cases, sand-tables, waste-baskets and special steel filing equipment. Incorporators are J. M. Unick, J. C. Unick and J. B. Lindstrom.

Philadelphia

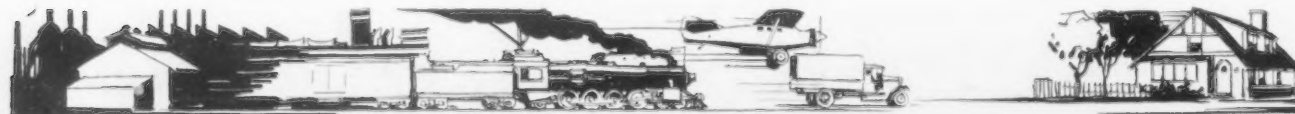
DEPARTMENT of Public Welfare, City Hall Annex, Philadelphia, John F. Dugan, director, is asking bids on general contract until May 29 for a new shop building at House of Correction, Holmesburg, in conjunction with other units, entire project to cost about \$500,000 with equipment. Philip H. Johnson, Architects' Building, is architect.

Philadelphia & Reading Coal & Iron Co., Reading Terminal Building, Philadelphia, has plans for a new electric-operated coal breaker in St. Nicholas district, Schuylkill County, to cost over \$1,000,000.

Board of Public Education, Keystone Building, Philadelphia, will receive bids until June 2, for equipment and supplies for public schools. Edward Merchant is secretary and business manager.

Frank Beemer, 1172 North Sixty-third Street, Philadelphia, and associates have organized Beemer Engineering Co., with capital of \$50,000, and plan operation of local factory for manufacture of draft controls and other engineering specialties. George H. Atherholt, Merion Golf Manor, Ardmore, Pa., will be treasurer of new company.

Jeddo Highland Coal Co., Jeddo, Pa., has plans for a new power house at



The Advertising PAGES

Save Your Time

Shopping around for ideas takes a lot of time. You have to visit, write letters and make phone calls in order to unearth them.

The Iron Age contains more advertisements than any other industrial publication (about a thousand), and by the same token it contains more ideas of value to you.

Cut down your time in shopping for ideas by going through the advertising pages of The Iron Age each week. A few of the hundreds of ideas in this issue:

Punch Output Increased 150 Per Cent

Formerly a punch stamped 40,000 pieces at a run. Using a different grade of tool steel boosted production to 100,000 pieces.

Job Time Reduced by Accessible Controls on Radial Drill

Because the operator no longer need walk around the work and machine to change speeds, a Diesel engine builder is now able to drill an engine fram in 9 hours instead of 1¹/₂.

Die Castings of 85,000 lb. per sq. in. tensile strength "as cast"

If aluminum bronze die castings are heat-treated, tensile strength may be increased to 100,000 lb. per sq. in.

Machining Time Cut from 29 min. to 19.

Old turret lathe lacked the power to take combined and multiple cuts. New turret lathe reduced by 34 per cent the time for turning, drilling and threading.

You Can Now Buy Wrought Iron in Plates

New product is superior to the excellent wrought iron plates of fifty or more years ago.

local coal-mining properties, to cost over \$50,000 with equipment. Ballinger Co., Twelfth and Chestnut Streets, Philadelphia, is architect and engineer.

Penn Surgical Mfg. Co., 1407 North Eighth Street, Philadelphia, manufacturer of surgical instruments, etc., plans rebuilding part of plant recently destroyed by fire, with loss of about \$50,000 including equipment.

Wayne Equipment Mfg. Co., Waynesboro, Pa., care of William H. Strauss, Waynesboro, recently formed by Mr. Strauss and associates, plans operation of local plant for manufacture of tools, mechanical testing devices and kindred equipment. J. E. Frantz, Waynesboro, will be one of heads of company.

Board of Education, Wilmington, Del., contemplates installation of manual training equipment in new school, to replace present school No. 25, to cost \$550,000, for which bids will soon be asked on general contract. Plans at office of Delaware School Foundation, Alexander J. Taylor, president.

Budd Wheel Co., Budd Building, Philadelphia, is operating at capacity for production of automobile wire wheels, with new stainless steel snap spokes, recently developed. Shipments in April exceeded any month in history of company, with a total of 357,701 wheel units; more than 4,000,000 lin. ft. of stainless steel was purchased by company during that month.

Pittsburgh

BOARD of Public Education, Administration Building, Pittsburgh, plans installation of manual training equipment in new three and four-story junior high and grade school to cost \$600,000, for which general contract has been let to Dick Construction Co., 2532 Library Road. J. T. Steen & Sons, Vandergriff Building, are architects; C. L. Woolridge, Fulton Building, is consulting engineer.

Malone Plumbing Supply Co., 210 First Avenue, Pittsburgh, has acquired entire block bounded by Twentieth, Twenty-first and Wharton Streets, and Fox Alley, improved with one-story building, 120 x 312 ft., and will remodel for new storage and distributing plant. Part of unit will be leased to Pierce-Butler-Pierce Mfg. Co., James Street, Syracuse, N. Y., manufacturer of boilers, heating equipment, etc., for a new factory branch and distributing plant.

Patrick J. Meehan, 3021 Bergman Street, Pittsburgh, and associates have organized Auto-Tite Joints Co., and plans operation of factory for manufacture of expansion and other mechanical joints, valves, etc. Edward W. Wright, 5442 Baywood Street, is interested in new company.

Appalachian Electric Power Co., Charleston, W. Va., has plans for a one-story equipment and repair shop, with automobile service and garage unit, to cost over \$70,000 with equipment. Warner, Tucker, Dilling & Hutchinson, Masonic Building, are architects.

Wheatland Tube Co., Wheatland, Pa., is completing remodeling former local plant of Joseph Greenspon's Sons Iron & Steel Co., recently acquired. It will be used for production of wrought iron pipe and facilities will be provided for about 300 operatives. New organization is affiliated with John Maneely Co., Philadelphia, iron piping, etc. Edward F.

Maneely is president of both companies. Benjamin A. Small will be general manager at Wheatland plant.

Duquesne Light Co., 435 Sixth Avenue, Pittsburgh, is arranging a bond issue of about \$25,000,000, part of proceeds to be used for extensions and improvements.

Milwaukee

PLANS are under way by Dunphy Boat Co., Menomonee Street, Eau Claire, Wis., for erection of a new plant to replace buildings recently destroyed by fire. First unit will be 60 x 100 ft., one story and basement. New equipment will be required for both wood and metal working. James Larsen is president.

DePere Paper Mfg. Co., DePere, Wis., specializing in production of wrapping paper, plans to rebuild mill, warehouse and office building damaged by fire with loss of \$250,000.

Common Council, Hartford, Wis., has plans by Jerry Donohue Engineering Co., Sheboygan, Wis., for alterations and additions to municipal sewage plant, to cost \$43,000. Bids will be taken about June 8. Rollin Abbott is city clerk.

Chain Belt Co., 1600 West Bruce Street, Milwaukee, is taking bids through Klug & Smith Co., consulting engineer, 111 East Wisconsin Avenue, local, for one-story addition, 90 x 106 ft., to Plant No. 3. W. J. Thurmman is plant engineer.

Globe Steel Tubes Co., Milwaukee, is investing about \$100,000 in plant improvements, according to Frank J. O'Brien, president and general manager. Project includes small addition to rolling mill unit and rejuvenation and additions to milling machine equipment. Plant is operating at about 50 per cent of capacity.

Lay & Winslow Co., Detroit, has acquired entire property of Fuller & Johnson Mfg. Co., Madison, Wis., manufacturer of industrial and farm gasoline engines, for \$75,000 and assumption of encumbrances, from trustees recently appointed to handle affairs. Outstanding obligations, exclusive of bond issue secured by mortgage, total about \$190,000.

Cincinnati

BIDS will soon be asked by Colonial Stages, Inc., 2123 Highland Avenue, Norwood, Cincinnati, for one and two-story motor bus garage, service and repair building, for which revised plans are being drawn, to cost over \$80,000 with equipment. J. R. Biedinger, Traction Building, is engineer, in charge.

Board of Education, Beaver Creek School District, Xenia, Ohio, Carl Merrick, clerk, plans installation of manual training equipment in new school to cost about \$180,000, for which bids will soon be asked on general contract. Walker & Norwick, American Building, Dayton, Ohio, are architects.

C. A. Henry Industries, Inc., Dayton, Ohio, has been organized to take over and expand company of same name with plant for manufacture of spark coil condensers and kindred electrical equipment. C. A. Henry and S. N. Brown head new organization.

Contracting Officer, Wright Field, Day-

ton, is asking bids until May 25 for four electric warehouse tractors and 10 electric trucks, 10 to 20 bomb rack assemblies, 147 spark plug testers and 187 spark plug gap setters; until May 26 for three motor-driven sheet metal-cutters, three hand-operated sheet metal brakes, two motor-driven power squaring shears, and 20 portable air compressors.

City Council, Owensboro, Ky., is planning a bond issue of \$250,000 for installation of a municipal natural gas distributing system, with compressor plants and other operating facilities. City engineering department will be in charge.

Knox County Board of Education, Knoxville, Tenn., plans installation of manual training equipment in new central high school to cost about \$200,000, for which plans are being drawn by Bauman & Bauman, 815 Market Street, architects.

Cherokee Oil Co., 2710 Linden Avenue, Knoxville, Tenn., is planning a one-story addition, 50 x 75 ft., to bulk oil storage and distributing plant, to cost close to \$10,000 with equipment.

Central Tobacco Warehouse, Inc., Johnson City, Tenn., has awarded a general contract to Johnson City Foundry & Machine Co., Johnson City, for one-story storage and distributing plant, 160 x 460 ft., to cost close to \$100,000 with mechanical-handling equipment.

Commissioner of Public Works, Lebanon, Tenn., is asking bids until May 26 for a raw water pumping plant and filtration works of 1,500,000-gal. daily capacity. Wideman & Singleton, Atlanta, Ga., are engineers.

Detroit

PLANS are being completed by General Electric Co., Schenectady, through its subsidiary, General Electric Realty Co., same address, for a multi-story factory branch, storage and distributing plant at Detroit, 80 x 160 ft., to cost over \$250,000 with equipment.

Wingler Aeronautical Corp., Inlay City, Mich., recently organized, has established a temporary plant for manufacture of airplanes and parts in buildings at local fair grounds. Work is under way on a new plant just outside city limits, scheduled for occupancy during summer. Company will specialize in production of biplanes, including parts and assembling, and also proposes to operate a flying school, with shop for repair and reconditioning of aircraft.

Hewitt Mfg. Co., 37 Manchester Avenue, Highland Park, Detroit, recently organized by William He, Highland Park, and associates, plans operation of local factory for manufacture of wire and cable. Addison E. Holton, Highland Park, is interested in new company.

James P. Marsh & Co., 2073 Southport Avenue, Chicago, manufacturers of steam specialties, industrial instruments, etc., a division of Commercial Instrument Corp., 105 West Adams Street, have purchased radiator valve manufacturing division of General Brass Co., 100 South Campbell Street, Detroit. Equipment will be removed to Marsh plant where production of new line will be concentrated.

Hupp Motor Car Corp., 3641 East Milwaukee Street, Detroit, has work under way on remodeling factory units recently acquired at Windsor, Ont., and will have



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BOX 135 CORAOPOLIS PENNSYLVANIA

new branch plant ready for service during summer.

Public Lighting Commission, City Hall, Detroit, is considering a one-story machine shop for general service and repairs on East Atwater Street, to cost about \$45,000 with equipment. Plans are also under advisement for a new power substation, to cost close to \$160,000 with machinery.

Monroe Paper Products Co., Monroe, Mich., has arranged for increase in its capital of \$1,000,000 with 100,000 shares of stock, no par value, part of fund to be used for expansion and improvements.

Electric Sorting Machine Co., 302 Anderson Building, Grand Rapids, Mich., recently organized, contemplates operation of plant for manufacture of special electric equipment. Lewis W. Tinkham and Hugo B. Hammerslag head company.

U. S. Pressed Steel Co., which recently disposed of its property at Ypsilanti, Mich., to Ford Motor Co., informs THE IRON AGE that item has been misconstrued as indicating that company has gone out of business, whereas it has been located since July, 1930, at Kalamazoo, having purchased from Youngstown Sheet & Tube Co. its subsidiary, Harrow Spring Co., which was merged with U. S. Pressed Steel Co.

Gulf States

PLANS are under way by T. B. Baker, head of Baker Hotel, Mineral Wells, Tex., for new hangar, 110 x 200 ft., at Easterwood Field, with repair facilities, to cost \$75,000 with equipment.

Florida Air Drying System, Inc., Miami, Fla., recently organized by E. J. C. Perkins, 1134 N. W. Fifth Street, Miami, and associates, with capital of \$50,000, plans operation of local plant for manufacture of air conditioning and drying machinery and parts.

Sinclair Refining Co., Sinclair Building, Tulsa, Okla., is considering expansion and improvements at oil refinery at Fort Worth, Tex., including additional equipment, to cost over \$100,000 with machinery. Headquarters of company are at 45 Nassau Street, New York.

Central Power & Light Co., San Antonio, Tex., has arranged for a bond issue of \$2,500,000, part of proceeds to be used for expansion and improvements in power plants and system. Company has purchased electric light and power and ice properties at Rockport, Bayside, Ingleside, Aransas Pass and Fulton and plans expansion, including new transmission lines; a new electric power substation will be built. Entire development will cost over \$100,000.

Texas & New Orleans Railroad Co., Ennis, Tex., has work under way on extensions and improvements in local engine house and locomotive repair shop, with facilities for handling 10 additional locomotives at one time.

Atlas Pipe Line Co., Giddens Building, Shreveport, La., is planning erection of a pumping station near Marshall, Tex., for booster service in connection with pipe line.

Board of Education, Donna, Tex., contemplates installation of manual training equipment in new two-story high school to cost over \$175,000, for which bids have been asked on general contract. Phelps

& Dewees, Gunter Building, San Antonio, Tex., are architects; W. E. Simpson & Co., Milam Building, San Antonio, are engineers.

City Council, Ocala, Fla., is asking bids until July 7 for furnishing and installing equipment in municipal electric light and power plant. City engineering department is in charge.

Indiana

BOARD of Trustees, Purdue University, Lafayette, has awarded general contract to A. E. Kemmer, Lafayette, for addition to power plant to cost about \$100,000 with equipment. Walter Scholer, Wallace Building, is architect.

Gritt, Inc., Indianapolis, recently organized, will take over and expand Gritt, Ragsdale & Co., 201-11 East South Street, manufacturer of radio lamps, novelty lamps and kindred products. Company will build a new plant later. Frank Gritt is president of new company.

Bids have been asked on general contract by Board of Trustees, Indiana School for Feeble Minded Youth, Fort Wayne, for new power plant including improvements in present steam power station, to cost \$195,000 with equipment. Appropriation has been authorized. R. W. Noland, Cal-Wayne Building, is consulting engineer.

Delco-Remy Corp., Anderson, manufacturer electric starting and lighting equipment, is planning early removal of its subsidiary, Butler Mfg. Co., Indianapolis, to Anderson works. Butler plant has been specializing in production of pistons and similar products and Anderson works will be developed for this line.

Gary Heat, Light & Water Co., Gary, recently secured by Midland Utilities Co., 72 West Adams Street, Chicago, an in-sull interest, is planning expansion and improvements, including additional equipment. George N. Rooker, formerly president of company, will continue with purchasing organization as vice-president.

Noblitt-Sparks Industries, Inc., 603 East Washington Street, Indianapolis, manufacturer of metal specialties, children's vehicles, etc., has purchased plant and business of Hilab Products Co., 227 South Meridian Street, manufacturer of rear-vision frames and mirrors for automobiles and other automotive products. Purchasing company will consolidate Hilab company with organization and plans expansion.

St. Louis

PLANS are under way by Central States Gas & Utilities Co., Kansas City, Mo., for a natural gas distributing system at Palmyra, Mo., to cost about \$60,000 with compressor station and other facilities.

E. G. Straub Contracting Co., Gloyd Building, Kansas City, Mo., has plans for two-story equipment storage and distributing plant, 83 x 130 ft., to cost about \$30,000 with equipment. Dean & Carroll, 713 Linwood Boulevard, are architects.

Enid Terminal Elevator Co., Kenwood Boulevard, Enid, Okla., has awarded general contract to Jones-Hettelseter Construction Co., Mutual Building, Kansas

City, Mo., engineer and contractor, for addition to grain elevator, to cost over \$175,000 with elevating, conveying, screening and other equipment.

Central Ice Service Co., Omaha, Neb., has secured a permit for a one-story electrically-operated ice-manufacturing plant, to cost close to \$100,000 with machinery. Headquarters are at Twenty-first and Campbell Streets, Kansas City, Mo.

Atchison, Topeka & Santa Fe Railroad Co., 80 East Jackson Boulevard, Chicago, has awarded contract to Roberts & Schaefer Co., 400 North Michigan Avenue, for automatic electric-operated locomotive coaling plant at Boise City, Okla., including steam drying plant, gravity sand unit and mechanical-handling cinder plant, to cost over \$150,000. G. W. Harris is chief engineer.

Riffe Brothers, Texhoma, Okla., have plans for a grain elevator to cost about \$90,000 with elevating, conveying, screening and other equipment. Superstructure will be placed under way at once.

J. G. Jakobe & Sons, Inc., 818 East Fifteenth Street, Kansas City, Mo., manufacturer of sheet metal products, has acquired site, 50 x 150 ft., and plans erection of new plant, to cost over \$30,000 with equipment. Work will begin in fall.

Symms-Shafer Mercantile Co., Colby, Kan., has plans for a one and two-story cold storage and refrigerating plant, 60 x 240 ft., to cost close to \$60,000 including equipment. Benjamin H. Byrnes, National Bank of America Building, Salina, Kan., is architect.

Missouri Pacific Railroad, St. Louis, will spend \$350,000 for new trackage and car icing facilities at Leeds, Mo.

Pacific Coast

BOARD of City Trustees, Brawley, Cal., is arranging a special election to approve a bond issue of \$150,000 for extensions and improvements in municipal electric light and power plant, including additional equipment.

Consolidated Feldspar Corp., 1047 Richmond Street, Los Angeles, plans rebuilding of portion of local mill recently destroyed by fire, with loss close to \$50,000 including equipment.

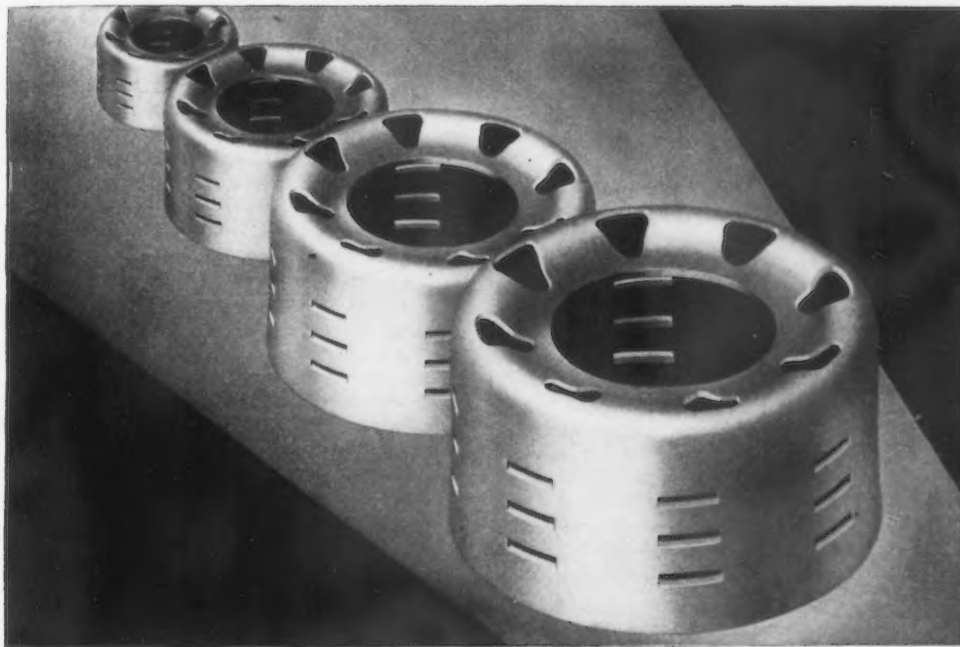
Albert C. Martin, Higgins Building, Los Angeles, architect, has plans for a one, four and five-story automobile service, repair and garage building, to cost about \$250,000 with equipment.

General Western Aero Corp., Goleta, near Santa Barbara, Cal., has awarded general contract to A. J. Roberts, Santa Barbara, for one-story plant for manufacture of airplanes and parts, to cost about \$30,000 with equipment. Other units will be built later.

Western True Vapor Phase Corp., 2800 North Gaffey Street, San Pedro, Los Angeles, will resume erection of a gasoline refinery, held in abeyance for several months, and expects to have unit ready for service soon. It will cost over \$70,000 with machinery.

Capt. H. B. Murse, San Rafael, Cal., United States Army, is in charge of plans for a group of buildings at army bombing base near Novato, Marin County, consisting of 11 hangars with repair facilities, shops, power substation, and number of units for townsite, including

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FROM the Wedge Products, Inc., of Cleveland, comes the report on a punch made from Midvale Diamond Brand Steel. Previously the best they had been able to do was 40,000 pieces at a run. The punch made of Midvale has already run 100,000 pieces and shows no wear of any kind.

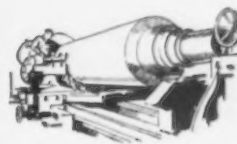
Midvale die steels and tool steels *must* stand up. For they are made primarily for use in Midvale's own shops, where they are put to the most severe use it is possible to exact from steel. And Midvale must meet the same requirements of prompt delivery and economical production demanded of you.

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TOOL STEEL

Midvale does not follow the "tonnage" method of tool steel production. Midvale charges with cold metal. Lets the ingots cool, to permit inspection for faults. Carefully chips out any cracks. Reheats ingots and reduces to billet size. Sand-blasts the scale. Again inspects and chips when necessary. Reheats and rolls to finished size. This is the only method by which tool steel of Midvale quality can be produced.



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To meet the requirements of Midvale shop operation, Midvale tool steel is tested under the most exacting conditions any steel can be asked to meet. Gigantic pressure vessels, heavy ordnance of the toughest metal, locomotive wheels whose composition is actually that of tool steel itself—steel of every variety of alloy, work from heavy roughing to that calipered to the ten-thousandth of an inch—all this is daily going through the Midvale shops—and *must go through on schedule.*



Business as Others See It

Digest of Current Financial and
Economic Opinion

APRIL has not struck the hopeful note which most observers wanted. At best, it appears to have been regarded as about a "stand-off," seasonal factors considered. Down a bit from March, but better than the earlier months of the year, appears to be the verdict—79.6 on the *Annalist* scale in April (as in March) was well above the 74.4 of January, for instance.

And Harvard Economic Society sees April holding up in physical volume of business, although falling off in terms of dollars.

"Despite the break in stock prices," says that service, "the volume of business during April saw the most general advance for a long time. [Outside] check payments made the first substantial gain in 11 months. . . . It appears that the business curve, which had declined continuously since October, 1929, rose slightly. . . ."

"In keeping with other evidences of a favorable turn in business, the number of business failures has apparently passed its peak and begun to decline. In other depressions, a decrease in failures has accompanied or followed an increase in the volume of business, and indications are that the same experience is now being repeated."

Bases Hopes on Lower Bank Rates

That organization looks for the lowered rediscount rates to "strengthen foreign exchanges and to direct funds into long-term investments, both of which effects should react favorably upon business."

That department store sales are on the rise is viewed as a favorable omen, but the gain is in physical volume—not in dollars. Federal Reserve Board figures put April 9 per cent above March in volume and the four months only 8 per cent (in dollars) behind January-April, 1930—a difference possibly less than that in unit prices.

Maladjustment of Wages

Wage rates in certain favored employments come in for another lambasting. Benjamin Baker (*Annalist*) says: "It is a pity that labor leaders should not have the intellectual capacity to see the need for adjusting wage costs to market resources, and the weight of leadership which would enable them to make necessary and temporary compromises with unyielding fact."

And, as *Financial Chronicle* puts it: "Why should wages alone remain upon a war basis? . . . 'Consumption' cannot be upheld by the

'high wages' of unionized technical labor. All other labor must help pay the bill. . . . How long shall a limited number, enjoying undiminished wages, pile up savings in the banks, while the many find it hard to live?"

Alexander Hamilton Institute cherishes the hope that the customary summer lull will this year be most moderate. "The general slackening of business is now less clearly defined. It is possible that sufficient resistance is developing to prevent business from reaching a new low this summer. If such proves to be the case, it will mean that definite recovery has been under way since the beginning of the year, and that a more satisfactory volume of business is in prospect for this fall than could otherwise be anticipated."

That "a return of prosperity in this country is almost entirely dependent upon a change in our mental attitude" is the thesis of Theodore H. Price, in *Commerce and Finance*. He says that "it is becoming increasingly clear that Europe will supply the motif for the next act or scene in the world's economic history." All of which ties in with tariffs and other points of international repercussion.

barracks, laundry, hospital, etc., entire development to cost over \$4,000,000.

Board of Education, Spokane, Wash., contemplates installation of manual training equipment in new school on Wellesley Avenue to cost \$400,000, for which general contract has been let to J. J. Lohrenz, Paulsen Building, Wells & Dow, Spokane, are architects.

California-Oregon Power Co., Medford, Ore., has plans for completion of hydroelectric generating plant on Rogue River, to cost over \$2,500,000 with transmission system. Company is operated by Byllesby Engineering & Management Corp., 231 South LaSalle Street, Chicago.

Varney Air Lines, Boise, Idaho, are planning erection of one-story hangar, 85 x 142 ft., with repair facilities, at municipal airport, to cost about \$35,000 with equipment. Leon B. Cuddeback is vice-president.

Pacific States Pulp & Paper Co., 319 Hutton Building, Spokane, Wash., will soon begin erection of new pulp mill at Priest River, Idaho, including power house, machine shop and other units, to cost close to \$1,000,000 with machinery. Charles W. Beardmore is president, in charge.

Foreign

NEGOTIATIONS are under way by Electric Power & Light Corp., 2 Rector Street, New York, and Govern-

ment of Mexico, Mexico City, for development of natural gas facilities in that country, to include pipe lines from Monterrey to Saltillo, and thence to Torreon, total distance of 260 miles, with compressor stations and other operating plants. Portion of gas supply will be secured from recently discovered fields in Mexican Aldasan district, near Monterrey. Entire project will cost over \$5,000,000. Company is affiliated with Electric Bond & Share Co., same address.

Board of City Governors, Milan, Italy, is planning erection of a cold storage and refrigerating plant with facilities for cooling and preparing for shipment about 1100 tons of fruit or other produce in 24 hr. It is also proposed to build a fruit sorting, grading and packing works, with conveying, packing and other handling equipment.

Soviet Russian Government, Moscow, which is building steel plants at Magnitostroy in Urals, and Kuznetsstroy in Siberia, has allotted 175,000,000 rubles (about \$87,500,000) for program during remainder of year, including purchases of equipment and other work for completion of projects. Development is also in progress for a hydroelectric power plant at first-noted place. Amtorg Trading Corp., 261 Fifth Avenue, New York, is official buying agency.

In connection with acquisition of electric light and power properties at Bucharest, Roumania, now being consummated between Electric Bond & Share

Co., 2 Rector Street, New York, and Government of Roumania, plans are under way for organization of new utility company to take over and expand local plants and system, including power sites now held by Hydrofina, a subsidiary of Sofina, an International Utility Holding Co., operating in that district. Purchasing company will develop power sites for hydroelectric generating service in carrying out an electrification program in different parts of Balkans.

Canada

ATWO-STORY addition, 60 x 130 ft., will be erected to plant of Fairgrieve & Son, Ltd., 50 Dovercourt Road, Toronto, manufacturer of washing machines, to cost \$55,000. A. B. Crealock, 156 Yonge Street, is architect.

Wrought Iron Range Co., Ltd., 149 King Street West, Toronto, whose plant was recently damaged by fire, will make repairs at a cost of \$40,000.

Graham-Paige Motor Car Co., Detroit, will remodel a building at Walkerville, Ont., for an automobile assembly plant.

National Fence Co., Ltd., Scott Building, Winnipeg, Man., is taking bids on erection of a factory, 50 x 75 ft., at Red Deer, Alta., to cost \$20,000.

